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Vol. 201. 85th Year. | LONDON, JANUARY 11, 1933. | No. 3634. Price 1s.

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Previous Announcement January 4.

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SEE ADVERTISEMENT LAST WEEK PAGE 6.

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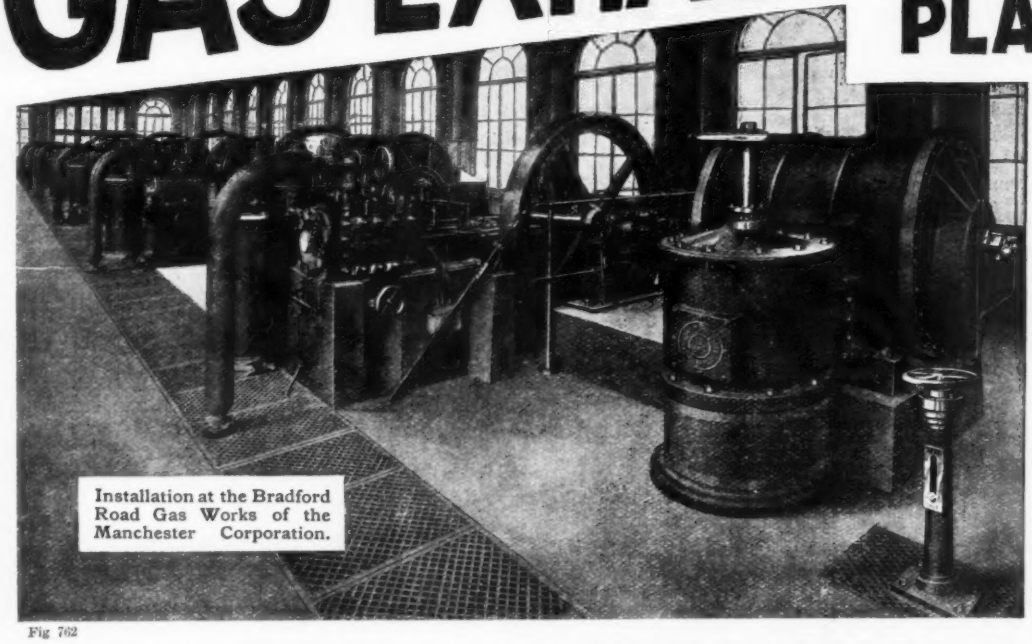

Installation at the Bradford Road Gas Works of the Manchester Corporation.

Fig 762

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The regulation of the Steam Engines is controlled by means of our Improved Hydraulic Regulator.

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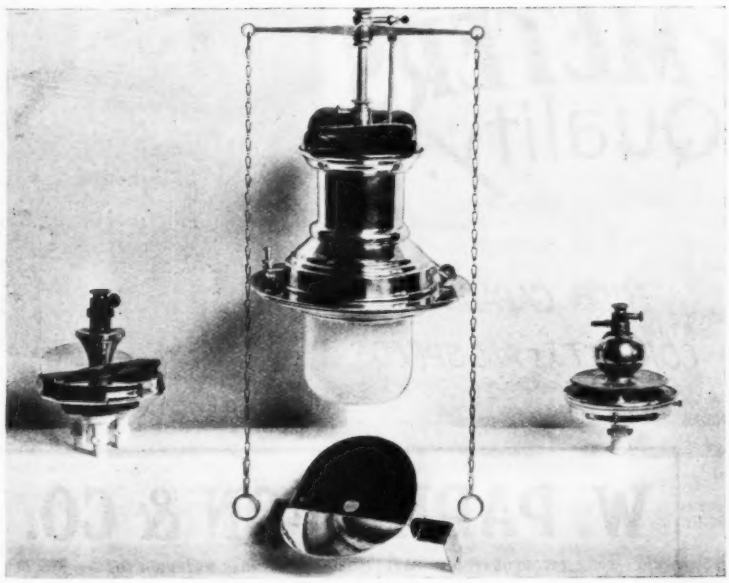

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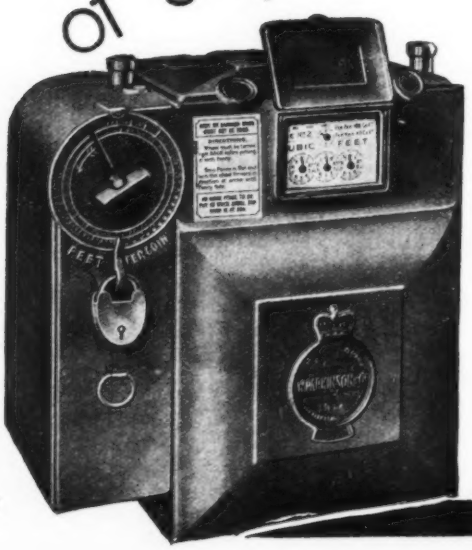

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THE GAS JOURNAL

JANUARY 11, 1933

Vol. 201. 85th Year No. 3634

A Glance at the Contents—

Index to Vol. 200.

With this issue of the "JOURNAL" is included the index to Vol. 200, covering the October-December quarter of 1932.

Combustion of Solid, Liquid, and Gaseous Industrial Fuels.

In a paper before the East Midlands Section of the Institute of Fuel, Mr. H. L. Pirie, M.I.Mech.E., dealt with this subject. [p. 96.]

New Davis Offices at Luton.

A photograph is published of the new offices of the Davis Gas Stove Company, Ltd., at Dallow Road, Luton. This, it is stated, will result in a very much improved service to customers. [p. 91.]

Making Uniform Jets.

A method of making and calibrating gas jets to ensure accuracy and uniformity of gas flow is the subject of an article. The manufacturers of these precision jets are Messrs. Amal, Ltd., of Birmingham. [p. 93.]

Fourth Census of Production (1930).

There was published in the "Board of Trade Journal" for Dec. 22, 1932, a supplement reviewing public services, including Gas Undertakings. The figures relate to 676 returns—426 from companies and 250 from local authorities. [p. 94.]

A Visit to Wapping Gas-Works.

Members of the London and Southern District Junior Gas Association took part in a visit of considerable interest on the afternoon of Saturday, Jan. 7, when they inspected the Wapping Gas-Works of the Commercial Gas Company. [p. 101.]

Gas in Industry.

In a paper before the Western Junior Gas Association on Dec. 15, Mr. E. Strother Davies, of the Bristol Gas Company's Industrial Department, gives details of his Company's industrial activities, together with some general remarks on fighting industrial competition. [p. 98.]

Forthcoming Engagements

Jan. 14.—SCOTTISH JUNIOR ASSOCIATION.—Joint Meeting in Glasgow. Address by Mr. C. Valon Bennett.

Jan. 14.—WESTERN JUNIOR ASSOCIATION.—Meeting at Exeter. Paper by Mr. D. L. Copp.

Jan. 18.—INSTITUTION OF GAS ENGINEERS.—Meeting of Meters Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Jan. 18.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

Jan. 19.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council Meeting at 2.30 p.m.

Jan. 21.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Halifax. Paper by Mr. J. Bradbury.

Jan. 27.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. P. Wedgwood.

Jan. 28.—WALES AND MONMOUTHSHIRE JUNIORS.—Meeting at Neath. Paper by Mr. A. J. Howells.

Feb. 2.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Address by Mr. H. Southern.

Feb. 4.—MANCHESTER DISTRICT JUNIOR ASSOCIATION.—Visit to Burnley Gas-Works. Paper by Mr. A. F. Rhead.

Feb. 4.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Meeting in Glasgow. Diploma Thesis by Mr. J. Webster and paper by Mr. N. C. Sturrock.

Feb. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee of the Council, 3 p.m.; Industrial Gas Committee, 4.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Feb. 14.—INSTITUTION OF GAS ENGINEERS.—Meetings of Council, 10 a.m.; Benevolent Fund Committee of Management, 12.15 p.m.; Education Executive Committee, 4 p.m., 28, Grosvenor Gardens, S.W. 1.

Feb. 15.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

Feb. 17.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. P. Richbell.

Feb. 18.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Bradford. Paper by Dr. F. J. Dent.

Feb. 21.—INSTITUTION OF GAS ENGINEERS.—Meeting of Gas Appliances Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Feb. 23.—JOINT JUNIOR ASSOCIATIONS.—Visit to B.I.F., Birmingham.

Feb. 28-March 2.—Joint Gas Conference at the B.I.F., Birmingham.

March 4.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Meeting at Glasgow. Address by Sir Francis Goodenough.

March 9.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. A. W. Attwood.

March 11.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bath. Four short papers.

March 15.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

April 19.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

EDITORIAL NOTES

A Comparison

A RECENT issue of the "Board of Trade Journal" contained a supplement reviewing public services and giving returns for 1930 for certain statutory and non-statutory gas undertakings. The returns relate to 426 companies and 250 local authorities, returns not being required from concerns employing ten or fewer persons. The figures are compared with similar ones for 1924—the year of the previous census. The comparison is full of interest, and demonstrates the growth and strength of the Gas Industry. The production of gas was over 16% greater in 1930 than in 1924, and, of the total quantity made, companies were responsible for 66%, compared with 65% in 1924. The calorific value of the gas produced by companies was about the same in the two years, but that of gas produced by local authorities increased by over 3%. The amount of gas purchased by supply undertakings amounted to 13,629 million c.ft.

Selecting a few more figures from those published in the "JOURNAL" to-day, we may mention that the average price of gas sold in 1930 was, for companies, 37·6d. per 1000 c.ft., and for local authorities 39·5d. The statistics relating to coke are illuminating. The average price per ton sold by companies was 23·01s. in 1930, compared with 30·44s. in 1924, while the average price of that sold by local authorities was 18·38s. in 1930 and 25·10s. in 1924. The total number of persons employed in 1930 was about 5% greater than in 1924, the increase in operative staff being about 3% and in administrative staff about 14%—which figures are significant of the greater use of labour-saving plant, greater technical control, and more extensive sales organization.

Basic Price Inquiry Report

A LARGE amount of space in the last two issues of the "JOURNAL" has been devoted to a full report on the Joint Committee of the House of Lords and the House of Commons who were appointed to consider whether, as one of the methods of giving effect to the basic price system of charge by gas undertakers in those cases in which a power to make a differential charge in respect of any part of the existing or intended limits of supply is proposed to be continued or granted, it is expedient to authorize a separate basic price in respect of each such part, arrived at by adding to the basic price fixed in respect of the area for which no differential charge is proposed a sum representing the differential charge as proposed to be authorized or continued, or as actually made. The inquiry occupied three days, during which the Committee (under the Chairmanship of Lord Meston) heard Counsel on behalf of the Board of Trade, on the one hand, and the National Gas Council, on the other, as well as certain witnesses called by the Council.

It was explained that the reason for the inquiry was that the Board of Trade, appreciating that the application of the basic principle was spreading, desired careful consideration of the problem of applying multiple basic prices to gas undertakings having differential prices in different parts of their areas, as distinct from the application of a single basic price for each undertaking. The Board did not put forward any alternative, but simply asked the Committee to report upon the multiple basic price system, which system the Board did not favour. In his address to the Committee, Mr. F. J. Wrottesley, K.C., excellently described the maximum price system, the sliding-scale, and the more recent basic price method —making clear the various features. He said that although so far only about twenty companies had adopted the basic system, they were big companies, and governed the supply of more than half the gas furnished in the country. The whole basic system was experimental; it had been tried only since 1920. It presented enormous advantages to the Industry, and, remembering that advantages to any industry in this country were worth thinking of at the present time, the Board of Trade, Mr. Wrottesley assured the Committee, did not desire to see the basic system abandoned. It was desirable to encourage the Gas Industry by means, if necessary, of the basic system carefully adapted so that it did no injustice.

Speaking for the National Gas Council, Mr. W. E. Tyldesley Jones referred to the proceedings on the Bath Gas Company's Order, which have been dealt with at length in our pages, and pointed out that the Committee of the House of Lords had decided in favour of the multiple basic system in that case. He quoted history to show that the desire of the Board of Trade (as expressed by Mr. Wrottesley) to see the basic system extended "was a recent conversion." Developing his main argument in favour of multiple basic prices, Mr. Tyldesley Jones submitted results showing that the basic price system had not resulted in a greater percentage of dividend increase than the increase under the sliding-scale, and that the application of multiple basic prices had not resulted in greater dividend increases than with single basic prices. The precedents, he said, were overwhelmingly in favour of multiple basic prices. In some of the areas where multiple basic prices were applied, the system had been in operation for about ten years, while other places had been subject to the system for nine years. If there had been unsatisfactory results, one would have expected to find evidence of that, but the Committee had not been told of a single complaint against the working of the multiple basic price system in those areas. Evidence was given for the Council by Mr. A. W. White (of Messrs. Cash, Stone, & Co.), Mr. George Evetts, Mr. Arthur Valon, and Mr. William Cash.

In the report which was issued subsequently by them the Committee explain the working of the basic price system, and conclude that "it is not expedient to apply in future cases the system of multiple basic price described in their terms of reference." Their decision is based upon the reasons given in the two following paragraphs of their report:

> The argument unfavourable to the multiple basic price lays stress on the possible injustice to the consumer. As has been seen, neither of the two alternative systems would act, more strongly than the other, as inducement for a uniform reduction of charges, provided that the full differential is maintained. The multiple basic price system, however, would tend to stimulate a reduction of the differential charge actually made in the new area, and might thus, it is feared, concentrate in the new area a lowering of rates which ought in equity to be spread over the consumers as a whole. If the differential which had been used in constituting the basic price for the new area had at the outset been pitched unduly high, this tendency would be encouraged. The consumers in the old area would thus, in effect, be contributing disproportionately to an increased dividend. The basic price with differential, on the contrary, does not lend itself to these possibilities. It should also be noted that under the basic price system the automatic control of the sliding-scale system has disappeared, and there might be a tendency to increase prices to the consumer in order to be able to pay an authorized additional dividend.
>
> The Committee have no reason whatever to doubt that gas companies conduct their business with the closest and most honourable regard to the interests of their consumers and the general public. In dwelling upon the possibilities of bias in one direction or another, the Committee are reasoning quite impersonally, and with reference rather to tendencies which they conceive Parliament would wish to prevent than to admitted practices which it is

desirable to check. This being so, they are impressed by the inexpediency of applying in future cases the form of multiple basic price which has been described. A subsidiary argument which carries some weight with them is the difficulty of determining the element in a multiple basic price which represents a fair differential. If that element is fixed with reference to the downward, but not immediately downward, movement of costs which ought to follow an increased output, there is a risk of its being pitched at a figure which is unremunerative at the outset, thus preventing any general advantage accruing to the consumers from the enlarged business. If, on the other hand, the differential is fixed at a figure which may be justified at the moment, but which the increased output would speedily permit of being reduced, then the initial basic price in the new area might soon become unduly high, and the Committee apprehend that difficulty would be found in approaching Parliament or the Board of Trade for early or frequent adjustments.

The Committee, therefore, do not feel that the basic price system in itself reaches finality as a method of charge.

Fixed Air-Gas Ratios

On several occasions during the past twelve months we have referred in these columns to the subject of fixed air-gas ratios for gas appliances, expressing the view that this is a desirable aim. It becomes increasingly difficult to justify the gas and air adjuster, in particular for lighting burners, within the narrow range of calorific value of 440 to 510 B.Th.U. per c.ft. The gas and air adjuster is only an expedient. Given a supply of gas at uniform pressure at the consumers' burners, and of uniform composition, we think that the standard of unalterable gas-air supply is that which gives the greatest satisfaction to the consumer. It is not good practice to ask the consumer himself to determine the conditions of maximum efficiency. At the annual meeting of the Institution of Gas Engineers last June, Mr. E. V. Evans, referring to the lighting load, said: " I hope it will not be a perennial of mine when I say that the standard of adjusted and fixed air and gas supply, in my opinion, helps very largely to maintain this *and other loads* [the italics are ours]. It makes the problem of gas manufacture at the works somewhat difficult, for not only has the calorific value to be maintained constant—and that we do to-day—but very careful attention has to be given to the specific gravity." We believe that the close working limits imposed by fixed air-gas ratios would benefit our Industry.

In the "Journal" for Dec. 21 last Mr. James W. Wood, Research Chemist to the Joint Committee of the Institution and Leeds University, discussed the subject of aeration. In practice a quantity of air somewhat in excess of the " theoretical air requirement " is needed to secure complete combustion; but, Mr. Wood observed, " it is surprising how small this excess need be under favourable conditions. In the case of the atmospheric burner the total amount of air is supplied partly as ' primary ' air and partly as ' secondary ' air, and designers are continually striving to produce burners in which the degree of primary aeration shall approach as nearly as possible to the theoretical air requirement of the gas, believing that combustion under such conditions must be more complete and more efficient than that obtained in existing types of burners. Of the truth of this assumption I have yet to be convinced." As we remarked in the " Journal " for Dec. 21, this gives an adequate working margin for the fixed air port and fixed gas injector.

Fluctuation in pressure is hardly a satisfactory argument for the retention of the air-gas adjuster. Maintenance of appliances is established as a necessary part of satisfactory customer service. Yet, with the gas and air adjuster, how many maintenance men really do satisfy the consumer that gas lighting is the best form of illumination? It is not the fault of the maintenance man that he has to adjust the burner at a pressure dependent on the time of his visit; and the consumer cannot be blamed for altering this adjustment at the time he requires light. This cannot be considered efficient practice.

A Notable Advance

In connection with fixed air-gas ratios it is necessary to ensure that the gas nipple employed shall in fact pass a known volume of gas under specified conditions in a given time; and in this respect we feel that a marked advance has been made by a Birmingham firm, Messrs. Amal, Ltd., in the manufacture and accurate calibration of gas jets. Working with the same drill under precisely the same conditions, drilling to the same Morse number, does not result in uniformity in a batch of gas nipples. It is, of course, possible to drill a nipple slightly below the required size and then reamer the jet to pass a given quantity of gas per unit of time, actually testing the nipple by gas flow; but such a course would be both laborious and expensive, and would add too much to the price of the jet.

What Messrs. Amal do is to drill the jet slightly below the required size, and then reamer it out to pass a definite number of cubic centimetres of petrol per minute. The instrument for calibrating the jets is of very great interest, and is described and illustrated in the " Journal " to-day. It is certainly an instrument of precision in which full faith can be placed. The calibration is a speedy operation, and it enables the firm to turn out a uniform batch of any number of jets of any given size. We say this after seeing batches of jets of different sizes made and calibrated by the firm and afterwards tested in the Industrial Research Laboratories of the Birmingham Gas Department. Actual test results are given on a later page of this " Journal." The petrol flow is correlated to gas flow, and it will be possible for gas undertakings to obtain uniform jets giving any rate of gas flow by reference to an " Amal Number "—this being the number of cubic centimetres of petrol the jet will pass in one minute. For example, with gas of specific gravity 0·465, an Amal Number 300 jet will give a flow of 7·2 c.ft. per hour at 2 tenths pressure, 9·1 c.ft. at 3 tenths, and so on.

We feel sure that the Gas Industry will be interested in this development.

Gas in Industry

That a welcome change has come over the Gas Industry in recent years is evidenced by the attention now paid to the industrial load by all the technical organizations. During the current session we have already had several valuable papers dealing with the problem, and not the least helpful is that published to-day by Mr. E. Strother Davies, of the Bristol Gas Company. Certainly his Company are on the right lines in establishing an Industrial Department as a specialized section of its sales activities; and though it is of recent formation much good work has been accomplished to date, and the Company have gained a great deal of useful information as to the equipment installed and the possibilities of extended sales in the hundred trades, comprising a thousand manufacturers, in their area of supply. By closer co-operation and service, good progress has been effected, and the orders for additional apparatus have been most encouraging.

The interpretation which Mr. Davies puts upon service is worth emphasizing. He sets out the four essentials of good service policy as follows: Expert advice must be available to the consumer on all matters relating to heating and heat treatment; facilities should be afforded for the carrying-out of tests; there should be an efficiently organized system of maintenance; and it is essential that any new equipment should have the approval of the operator. Many improvements have been condemned because they did not have the goodwill of the worker. And we are in complete agreement with the author's emphasis on the maintenance of constant gas pressure at the burners of industrial equipment. No appliance can be expected to work efficiently where there is fluctuation of pressure at different times throughout the day, and we think that our Industry will retard its progress if it does not pay more attention to governors.

PERSONAL

SIR FRANCIS GOODENOUGH.

Sir Francis Goodenough's many friends will be very glad to learn that his condition, following his operation on Dec 29, is regarded as entirely satisfactory, and that he is making excellent progress towards recovery.

* * *

MR. JOHN T. LEWIS.

We congratulate Mr. John T. Lewis on the fiftieth anniversary of his appointment as Engineer and Manager to the Wellingborough Gas Light Company, Ltd. Mr. Lewis was

MR. JOHN T. LEWIS,
Fifty Years Engineer and Manager at Wellingborough.

appointed Assistant Manager in 1878, when the production of gas for the year was 24 million c.ft. Last year the Company produced 311 million c.ft. of gas. This year the Company is to celebrate its centenary. The policy of the Company has always been a progressive one. On the manufacturing side they were early in the field with regenerative settings and manual stoking machines. In the autumn of 1903 the works was removed from London Road to the Union Road site. The new works was equipped with modern regenerator settings of horizontal retorts and West's compressed-air stoking machinery with coal and coke elevators and conveyors. This was supplemented by Humphreys & Glasgow water gas plant, subsequently extended and modernized, and in the autumn of last year one section of the horizontal retorts was replaced by an installation of Glover-West continuous vertical retorts. The London Road site is retained as a storage and distribution station.

* * *

FIFTY YEARS IN THE GAS APPLIANCE INDUSTRY.

Mr. Max Falk's Business Jubilee.

The many friends of Messrs. Falk, Stadelmann, & Co., Ltd., of 83-93, Farringdon Road, E.C., will, we are sure, join us in extending congratulations to Mr. Max Falk, Chairman of the Company, upon the completion of fifty years' service with the firm.

The undertaking was established at 36, Basinghall Street, London, on Jan. 16, 1882, by Mr. Salamon Falk, his eldest brother, and Mr. Max Falk entered the business in a junior capacity the following year. A third brother, Mr. Victor Falk, was also in the firm. At this time the total staff comprised no more than four persons, and the activities, according to the first circular letter sent out to the trade, embraced the manufacturing agency and importation of gas fittings, opal globes, gas burners, silvered and polished sheet and plate glass, rolled plate glass, opal sheet glass, &c. After a short time the firm removed from Basinghall Street to Colonial Building, Hatton Garden, where the business developed into a more general one of lighting fittings and accessories for gas, oil, and electricity. It was here that Mr. S. Falk was joined by his two brothers, and in 1887 he formed a limited liability company, with Messrs. Jean Stadelmann & Co. (manufacturers of gas burners, for whom he had previously acted in the capacity of agent) and removed to larger premises in Farringdon Road. In 1889 they moved to the still more commodious quarters in the same thoroughfare which they now occupy, and in the course of time opened branches in Glasgow, Manchester, Birmingham, Dublin, Newcastle-on-Tyne, Cardiff, Leeds, Liverpool, and overseas. The business became a public company in 1928, and is allied to the firm of Messrs. Stoves, Ltd., of Rainhill. From this time the firm never looked back, and from specializing particularly in the lighting business, have more recently entered also the fields of cooking and heating with conspicuous success.

Mr. Max Falk, in conversation with us the other day, recounted the remarkable changes and progress he has witnessed in the Company since he entered their service fifty years ago. From the two rooms they occupied in Basinghall Street, the firm's premises now include spacious and up-to-date offices and showrooms in Farringdon Road, E.C., together with extensive factories at Wandsworth and Birmingham, in addition to their numerous branches all over the world. From a staff of four, the number employed has grown to 2200; from the manufacture of the "Veritas" central air draught oil lamp, with which they virtually made their début, the firm's activities now cover a wide range of gas, oil, and electrical apparatus for lighting, heating, and cooking purposes; from the days when they imported a large proportion of goods from abroad, the position is now entirely reversed, and 78% of the goods sold are of British manufacture and made in their own works, the only foreign products supplied being glassware; and from the early days when the Company's capital barely reached £9000, to-day it is in the region of a million pounds, fully paid up.

Catering for the Gas Industry.

It is not, perhaps, fully realized in the Gas Industry at the present time what a great deal of energy Messrs. Falk, Stadelmann, & Co. expend in catering for the gas interests. That they are continually not only improving upon the apparatus they have to offer, but are also placing new appliances of an efficient and reliable type on the market, is evidenced from time to time in these columns; while it is of interest to note that a special staff is fully engaged in dealing exclusively with the gas business.

MR. MAX FALK,
Chairman of Messrs. Falk, Stadelmann, & Co., Ltd.

It was in the year 1902 that the Company first entered upon the manufacture of the article which has perhaps more than anything else made its name a household word—namely, the "Veritas" incandescent mantle—and some idea of the work carried out and the care exercised in its execution at the Company's "Veritas" works at Wandsworth was given in the "Journal" for Dec. 7 last. The firm's large factory at Birmingham is devoted to the production of gas fittings and burners.

The Company have always been particularly attentive to

Property of
Seattle Public Library

the personal touch in their relationship with business friends, and Mr. Max Falk himself has been untiring in the zeal and energy he has displayed in furthering the interests of the business. For more than a quarter of a century he was personally engaged in travelling all over the country on the firm's behalf and establishing connections in the Gas Industry; it is, in fact, in no small measure due to his enterprise and initiative that the firm owes its enviable position in the Industry to-day. In 1921 Mr. Max Falk travelled to Australia and New Zealand on behalf of his firm, and visited their two branches in the former country and one in the latter, in addition to visiting many towns of importance in the interests of the business.

Mr. Max Falk was elected to the Board of Directors of the Company in the year 1895, and was appointed Chairman upon the death of his brother, Mr. Salamon Falk, in 1913. In commemoration of his fifty years with the firm, Mr. Max Falk has been presented by his co-Directors with a gold cigarette case inscribed as follows:

> "Presented to Mr. Max Falk on the completion of half a century of devoted service to Falk, Stadelmann, & Co., Ltd., January, 1933."

All those who know Mr. Falk will wish him continued health and energy for many years to come to carry on his good work for the Industry.

* * *

PRESIDENCY OF THE JOINT GAS CONFERENCE.

Owing to his serious illness Sir FRANCIS GOODENOUGH has been obliged to resign the Presidency of the Joint Gas Conference to be held at the British Industries Fair, Castle Bromwich, Feb. 28 to March 2.

At short notice, Dr. G. C. CLAYTON, M.P., C.B.E., J.P., Chairman of the Liverpool Gas Company, has consented to accept this office.

* * *

The Postmaster-General has appointed a new Post Office Advisory Council to act in a consultative capacity on matters of general Post Office policy and to serve as a further connecting link between the Post Office and the public. Sir FRANCIS GOODENOUGH has been appointed a member of the Council.

* * *

Mr. WILFRED M. GLEDHILL, son of Mr. T. Gledhill, Manager of the Filey Gas Undertaking, and who has latterly been in the service of Messrs. West's Gas Improvement Company, Ltd., at Manchester, has been appointed Assistant Engineer to the Stirling Gas Company.

OBITUARY

The death has occurred, at the age of 66, of Mr. EDWIN DARBY, of the "Hurry" Water Heater Company, 39, Broad Street, Birmingham. Deceased, whose home was at Shrawley, Worcs., was very well known in the Midlands. He was a member of St. Alphege Lodge of Freemasons.

Correspondence

"Simplex" Water Gas Plant

SIR,—In order to prevent any misunderstanding among gas engineers, we wish to state in reference to the paragraph appearing in "Trade Notes" in your issue of Jan. 4 that there is now no association between the plant there mentioned and the improved type "Simplex" water gas plant as exploited during the past twelve years and manufactured only by this Company.

Yours, &c.,
E. LINSLEY,
Managing Director.

The Vertical Gas Retort Syndicate, Ltd.,
17, *Victoria Street, S.W.* 1,
Jan. 6, 1933.

THE NEWS OF THE WEEK

The Chesterton R.D.C. is making arrangements to acquire the Cottenham Gas and Waterworks Undertaking for £4000.

The Colwyn Bay Urban Council are to make application to the Ministry of Health for sanction to borrow £6000 for gas mains and services.

The Services of an Expert Gas Engineer are to be retained by the Mansfield Town Council to report on the question of purchasing gas in bulk. The Corporation Gas Department's annual make, according to the latest returns, is 280 million c.ft.

The Cookery Demonstrations which commenced at Hereford on Nov. 24 and concluded on Dec. 5, were, according to a report by the Gas Committee, attended by 1441 people. It has been decided to hold the 1933 cookery lectures from May 8 to 19 (inclusive) in the town hall.

A Noteworthy Change-Over in Derby is the intention of Messrs. Midland Drapery to abandon the Corporation electricity supply. It has been decided to install generating plant, and a gas engine, the latter to be supplied by Messrs. Crossley Bros. While Derby business men are talking about the change, the exterior lighting of the large building in question has reverted to gas.

Increased Demand for Gas in Greenock.—A statement submitted at a meeting of the Greenock Corporation Gas Committee indicates a steady improvement in local industry as judged by the increased consumption of gas. For the first seven months of the financial year the increase in gas made at the Inchgreen Works has been 1½%. The report was commented upon as showing a sign of improving conditions, and was received with satisfaction.

Expert Information on the applications of gas-fired conveyor ovens to the work of drying various types of enamels, lacquers, and varnishes is contained in No. 226 of "A Thousand-and-One Uses for Gas," published by the B.C.G.A. The design and choice of ovens; the effects of stoving on various constituents and on different types of finishes; and the advantages of gas—simplicity, reliability, and economy—are among the subjects treated at length. The issue is illustrated with excellent photographs of installations at various works.

After a Heated Argument the Haworth Urban District Council, at their January meeting, rescinded by a majority of one vote a previous decision to utilize a newly-purchased building as a Joint Gas and Electricity Department's showroom. Lively discussion took place as to the use to which the premises should be put, and on a further vote the gas interests won again by a majority of one vote, it being decided that the building be utilized as a gas showroom only. A suggestion that electrical appliances should be displayed occasionally was not carried to the length of a vote.

The Finance Committee of the Sunderland Corporation have reported that, in pursuance of the suggestion made by the Director of Gas Administration of the Board of Trade, they have conferred with the representatives of the Sunderland Gas Company upon the objections of the Corporation to the provisions of the Sunderland Gas Special Order, and that the Gas Company have declined to meet the Corporation's objection. The Town Clerk will therefore be authorized to take necessary steps to continue the Corporation's opposition to the making of the Order. The Order would be to fix a basic price for gas.

THE NEWS—continued.

The Maclaurin Plant at Glasgow, it is announced by the Glasgow Corporation Gas Committee, is to be put up for sale. It will be remembered that consideration was given, on the suggestion of Mr. J. W. McLusky, the Engineer and General Manager, to a proposal to convert one of the five generators into a carburetted water gas unit at an estimated cost of between £4000 and £4500. Having regard, however, to the excessive cost involved, it has been decided that the conversion be not proceeded with, and that the plant be advertised for sale.

The Post of Deputy Engineer and Manager to the Burnley Gas Department, it is understood, is to be re-created, but it was not decided without some discussion at the Town Council meeting. The position has been in abeyance since Mr. Howe secured another appointment. Mr. R. J. Restall, the Works Manager, recently secured the position of Gas Engineer and Manager to the Stalybridge Corporation, and when considering the vacancy the Gas Committee decided once again to have a Deputy Manager so that in the absence of the Manager there would be some one in charge with full authority. The commencing salary will be £400 per annum.

The Improved Illumination of Street Names by means of gas lighting has been the subject of a recommendation recently made at Hull by the City Engineer. This consists of printed names on celluloid adhesive transfers which are affixed to the glass of street gas lanterns. These transfers are similar to those used on the lamps of railway stations, and have been put into successful operation in Birmingham and Belfast. The transfers, it is stated cost 1s. each and can be fixed by a painter at an estimated cost of 8d. each. The City Engineer has been authorized to expend £25 in this direction on the West Hull, North Hull, and East Hull housing estates as an experiment.

In Praise of Gas.

"John o' London's Weekly" recently gave a prize for the best monosyllabic praise of the therm, and the winning entry was as follows:

Gas is lord of life and death; it gives, and takes, what we call "breath." It lights man's gloom and cooks his goose, nor need he croak: "Hey, where the Juice——!" But do not let it take a trick,* or it may turn you pale and sick. Give it a purr,* and there's your fag—and lit at that. Gas does not flag; it does not glare or blink or bore; no eye is strained, there's no eye sore. No dust, no ash, no vile soot heap; yet, in the Main, it is Dirt Cheap. The coal man does not foul your floor, nor does the Sweep put in his oar. Cool when it's hot, warm when there's frost, you pay for what is *used*, not *lost*. Blown out, the gas, though out of use, yet once more serves to cook your goose.

* Gas-tric; gas-per.

The successful competitor was Mr. A. Powell, 2, Greyswood Street, Streatham.

The Trade Journal.

With the current issue, our old-established contemporary, "The Ironmonger," founded in 1859, enters upon a new stage in its long and honourable career in trade journalism. During the past few weeks negotiations have been in progress and are now concluded by which the "Hardwareman and Ironmongers' Chronicle" will be incorporated with "The Ironmonger." The title of "The Ironmonger," which has the backing of a long history and tradition, will not be changed upon the amalgamation.

The opportunity was taken in a leader in the issue for Dec. 31 to refer to the early history of "The Ironmonger," in relation to several other trade publications, including the "JOURNAL," which were established about the same period, and we quote from this as giving some interesting facts relative to some of our earliest contemporaries:

"The present occasion seems to offer an opportunity of putting forward a claim which we do not think can be disputed. The three journals which the proprietors of the old merchant business of E. P. Halse developed from their monthly trade circulars are the oldest trade papers for retailers in this country, and by inference in the English-speaking world. Of these three 'The Ironmonger' is the senior by six months. 'The Chemist and Druggist' was not published until September, 1859, and the third journal, 'The Grocer,' in 1861. We are aware that there are other journals with a longer record, but these were really publications for professional men which, as the years went by, incorporated advertising in their pages. 'The Engineer,' now published in Essex Street, Strand, is three years older than ourselves, and the 'GAS JOURNAL' was even earlier still; it goes back to 1849. Poultry breeders had their first journal in 1840, and the 'thirties saw one devoted to mining and another to railways. These three have had a continuous existence, but none of the foregoing was founded as a trade paper in the sense that it was concerned entirely with commerce as distinguished from various branches of industry and production. Much older than any of these is a journal devoted to pawnbroking, which was established in 1758 as 'The Bow Street Bell.' We can only guess its original purpose, and in any case we do not think anyone would maintain that 'Uncle's' establishment is a retail shop."

The B.I.F. at Castle Bromwich.

In connection with the forthcoming British Industries Fair, the Leamington Spa Manager, Mr. W. J. Leist, would be pleased to find accommodation for gas engineers visiting Castle Bromwich. Leamington Spa is only twenty miles from Castle Bromwich by road, and there is a very good train service between Leamington and Birmingham.

Within a few miles' radius of Leamington Spa are Stratford-upon-Avon, Warwick, Kenilworth, and Coventry, places of considerable interest to visitors.

Institution of Gas Engineers.

Members of the Institution of Gas Engineers are invited to attend the meeting of the Institution of Chemical Engineers in the Rooms of the Chemical Society, Burlington House, Piccadilly, W. 1, on Wednesday, Jan. 25, at 5.30 p.m., when the following papers will be presented:

"British Practice in Sewage Disposal," by Mr. H. C. Whitehead, M.Inst.C.E., and Mr. F. R. O'Shaughnessy, F.I.C., M.I.Chem.E.

"Sewage Treatment in America," by Mr. L. R. Howson.

"German Practice in Sewage Disposal," by Dr.-Ing. Karl Imhoff.

Tea will be served at 4.45 p.m. Tickets of admission are not required.

Health Exhibition, Blackpool.

In June of this year, that popular seaside resort, Blackpool, will be welcoming the delegates from all parts of the world who will be attending the Annual Congress and Exhibition of the Royal Sanitary Institute.

The Exhibition, to which the general public are also admitted, will give practical illustration of the many appliances and products used in municipal administration, in hospitals and other public institutions, and in the home. Manufacturers therefore have an exceptional opportunity of bringing forward any articles which tend to help in the betterment of the health of the nation.

At the Offices of the Institute, 90, Buckingham Palace Road, London, S.W. 1, the arrangements for the Exhibition are well ahead, and a successful show seems to be certain.

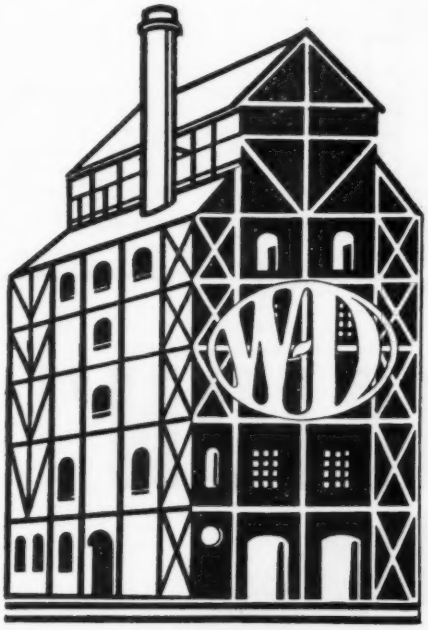
Municipal Gas Management.

Prospective Saving in Income-Tax.

At the Monthly Meeting of Airdrie Town Council a minute of the Finance Committee was approved in regard to a scheme by which it is hoped to effect a considerable saving in income-tax.

The Town Clerk suggested to the Committee that with a view to making further and better provision with reference to the finances of the Burgh, and the application of revenue from their undertakings, the Committee should consider the desirability of making application to the Secretary of State for Scotland, under the provisions of the Private Legislation (Scotland) Act, 1899, for authority to merge the Gas-Works Undertaking in the Burgh Fund, which would enable the Council to credit to the Fund not only all moneys raised by the Consolidated Rate, but also all moneys received by them on account of the revenue of the gas-works (including the revenues of any reserve, depreciation, or renewal fund of such undertaking), and to defray therefrom not only all expenditure of the Council payable out of the Consolidated Rate, but also all expenditure of the Corporation in respect of the gas-works, which was a public utility undertaking. If this was done, a considerable annual saving in income-tax might be effected. The Town Council approved of the recommendation, and authorized the Town Clerk to confer with the Council's Parliamentary Agents regarding the matter, and report to next meeting.

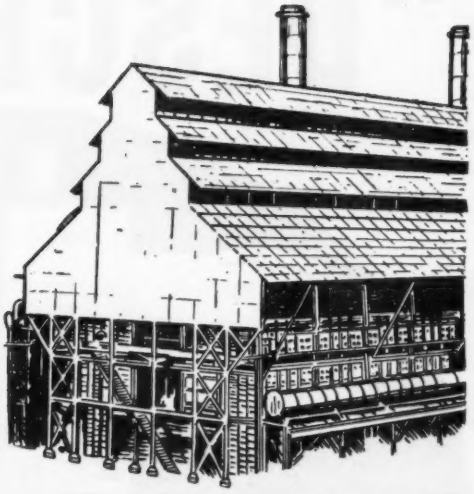
WOODALL-DUCKHAM VERTICALS



CONTINUOUS

275 INSTALLATIONS
In Operation or Under Construction
THROUGHOUT THE WORLD

TOTAL CAPACITY **517,000,000** CU. FT. OF GAS A DAY



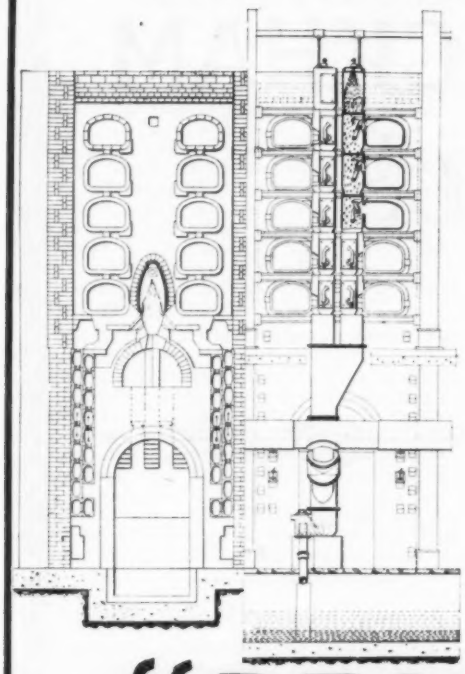
INTERMITTENT

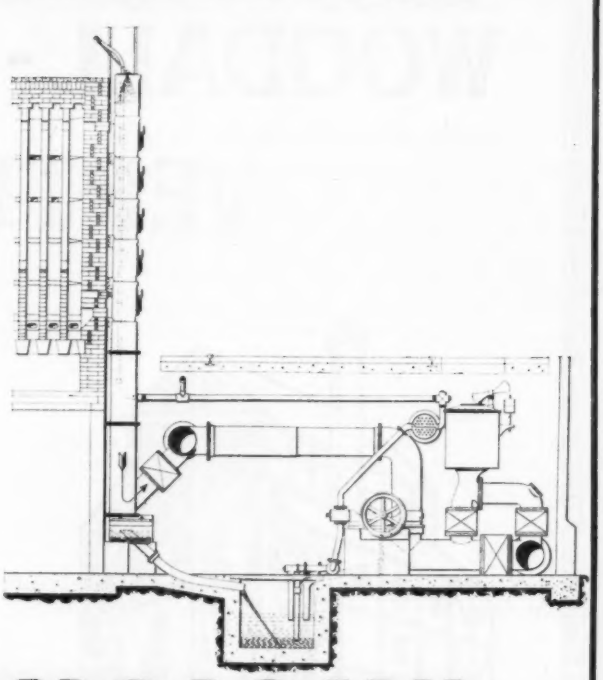
13 INSTALLATIONS
In Operation or Under Construction
IN THE UNITED KINGDOM

TOTAL CAPACITY **32,700,000** CU. FT. OF GAS A DAY

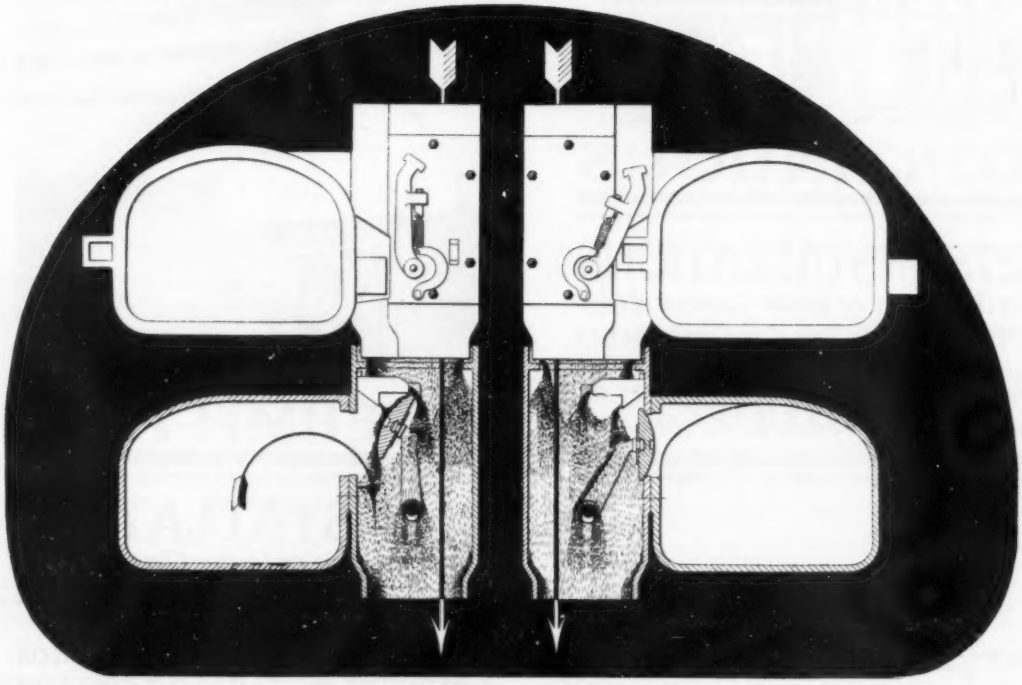
THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO. (1920) LTD.
ALLINGTON HOUSE 136-150 VICTORIA STREET,
LONDON, S.W.1.

MODERN HORIZONTALS





"DESCENSION"



ROBERT DEMPSTER & SONS, LTD.,

Wire: "DEMPSTER" ELLAND **ELLAND.** 'Phone: ELLAND 261.

Lighting of Gasholders.

In the "JOURNAL" for July 27, 1932, we referred to a "Guide to Aerodrome Lighting" issued by the British Standards Institution and published with the approval of the Air Ministry. Since the issue of the "Guide," the International Commission on Illumination has met in Zurich, and has put forward recommendations which apply to lighting aerodromes and air routes.

Whereas in the Guide aerodrome obstructions were defined as those within 500 yards of the perimeter, the International Commission has increased this distance to 1000 metres. If and when the recommendations dealing with airway obstruction lights become law, their effect will be to make compulsory the lighting of such obstructions as gasholders and tall chimneys.

Hopeful Prospects of the B.I.F.

Ten thousand copies of the advance overseas edition of the catalogue of the 1933 British Industries Fair, which opens on Feb. 20 and continues to March 3, were dispatched to prospective overseas buyers by the Department of Overseas Trade last Saturday.

As the catalogue indicates, the Fair will be of record proportions. It contains, for example, descriptions of the displays of some 1429 exhibitors in London—at Olympia and the White City—compared with 1230 in the corresponding catalogue for the last Fair. Olympia, as formerly, is devoted to the "lighter" industries, with the notable exception of furniture. On account of its growth, the Furniture Section this year has been moved to the White City, which it shares with the Textiles Section. The combined areas occupied by all Sections at Olympia and the White City this year amount to some 455,900 sq. ft., compared with 392,200 sq. ft. at the last Fair, which itself was larger than any previous Fair.

Accompanying the advance catalogue is a list of exhibitors in the "heavy industries" section of the Fair at Castle Bromwich, Birmingham, with a summary of the scope of each of the chief industrial groups. The indoor exhibition area at Castle Bromwich amounts to 250,000 sq. ft., and both additional buildings and outdoor space have been provided this year at Birmingham, where the pressure on space has been so overwhelming that many exhibitors have already agreed to share their allotted space with those who otherwise would have been crowded out.

Altogether the floor area of the buildings occupied in London and Birmingham will be nearly 30 acres, and the frontage of the indoor stands will run to round about twenty miles. More overseas buyers than ever have indicated their intention to visit the Fair this year.

Christmas Window Display at Sheffield.

The accompanying photograph shows the Christmas window display at the chief showrooms of the Sheffield Gas Company, 15/17, High Street, Sheffield. The display was a very effective one, and shows a happy domestic scene with each member of the family in possession of a personal gift, the gas fire with its cosy heat contributing to the happiness. In the background is Father Christmas with his message, "GAS for Christmas and Ever After," while the card in the centre bears the message, "The Personal Gift Plus a Gas Fire." A second card is placed on the mantel shelf bearing the seasonable greeting, "The Compliments of the Season to all Gas Consumers." During the festive season the window proved a great attraction to the general public.

New Davis Offices at Luton

The photograph shows the exterior of the new offices of the Davis Gas Stove Company, Ltd. (Radiation Ltd., Proprietors), at Dallow Road, Luton. The amalgamation of the accounting staff from London and the office staff at Luton has not only necessitated an entirely new building, but will result in a very much improved service to customers. The aim throughout has been to obtain a building on the most up-to-date lines embodying all the most efficient office methods. At the same time the artistic side of the question has not been overlooked, both inside and out, as the photograph shows. Further, the health and well-being of the staff have been considerations of first importance. The very latest system of heating, ventilating, and air-conditioning has been installed, and in the summer cool, fresh air is circulated in place of the warm air in winter. All windows with a southern aspect are fitted with "Vita" glass. All clerks, typists, &c., have their own separate desks together with intercommunicating telephones, bells, controls, and so forth. All the panelling and furniture is in a pleasant shade of limed oak, and a system of side overhead lighting makes the office as bright and cheery as modern conditions demand. It is further interesting to note that the whole building, inside and out, has been designed, planned, and constructed entirely by the firm and the Nautilus Company.

THE NEWS—continued.

Gas Cookery Demonstrations.

The Mayoress of Chesterfield (Mrs. A. W. Swale) opened a series of practical gas cookery demonstrations and exhibition of modern gas appliances at the Gas Service Department, Knifesmith Gate, Chesterfield, on Tuesday of last week. Among the large number present were the Mayor (Councillor A. W. Swale), who is Vice-Chairman of the Gas Committee, Alderman G. Clark (Chairman of the Gas Committee), Mrs. Clark, Mr. H. Davies (Gas Engineer), and Mr. S. Davies (Retail Sales Manager).

This photograph was taken without a "flash," the lighting effect being arranged by gas.

The Mayor said they desired the public to become accustomed to the idea of using gas. The Committee and Management would be pleased if the public would make full use of the showroom, where, in case of difficulty, advice and service would be given.

The Mayoress, in declaring the demonstration and exhibition open, said that as she looked round the exhibition her mind went back to the old gas stoves which they utilized in the home in times gone by. She also recollected having the first gas copper that came into Chesterfield. A great advance had been made in the various gas appliances, and the Gas Department gave a very efficient service.

Alderman Clark, in expressing thanks to the Mayor and Mayoress for their attendance, emphasized the advantages of the modern gas oven, which could be regulated, and so ensure a meal being cooked without attention.

The cookery demonstrations were given by Miss Joan Baker, First-Class Diplomée, N.T.S.C., and Miss Margery Collis, M.C.A. A Radiation "New World" gas cooker with "Regulo" automatic oven heat control was used, and in the evening a complete dinner was cooked at one "Regulo" setting and time without attention.

The series of demonstrations and the exhibition were brought to a conclusion on Friday, when the Mayoress presented prizes to the successful entrants in a cake-baking competition.

Owing to the indisposition of Mr. H. Davies, his wife thanked the Mayoress, and asked her to accept a bouquet of pink carnations, which Miss Grace Davies presented to her.

The Mayoress, replying, congratulated everyone concerned upon the success of the demonstrations.

The attendance at the lectures for the four days was 800. The arrangements for the demonstrations were carried out by Mr. S. Davies.

Ideas for Easy Home Management.

A novel scheme has been adopted by the Newcastle-upon-Tyne and Gateshead Gas Company for drawing the attention of new occupiers of houses in their area to the many ways in which they can use gas to their advantage and whereby the Company can be of service to them.

This takes the form of cards, with Business Reply Postcards attached, which the Company's outdoor representatives hang up in prominent positions inside empty houses during changes of tenancy. This card points out how the previous occupier of the house enjoyed the convenience and economy of gas cooking, which has become an indispensable item in every modern home, and states that the Company will welcome all opportunities of giving assistance which will enable the new occupier to derive to the full all the benefits that gas service offers.

On the reverse of the card are listed the various uses to which gas can be put in the home, under the heading of "Ideas for Easy Home Management," while on the back of the attached Reply Card the consumers are invited to mark on a printed list the appliances in which they are interested and return it with their names and addresses to the Company, when a representative will call.

Croydon Gas Company.

The Croydon Gas Company, stated the "Financial Times" in a recent "Potential Investments" column, was incorporated by the Special Act of 1847 as the Croydon Commercial Gas and Coke Company, and the present name was adopted in 1904. In 1905 the Undertaking of the Caterham and District Gas Company was acquired and that of the Oxted and Limpsfield Gas Company as from Jan. 1, 1931.

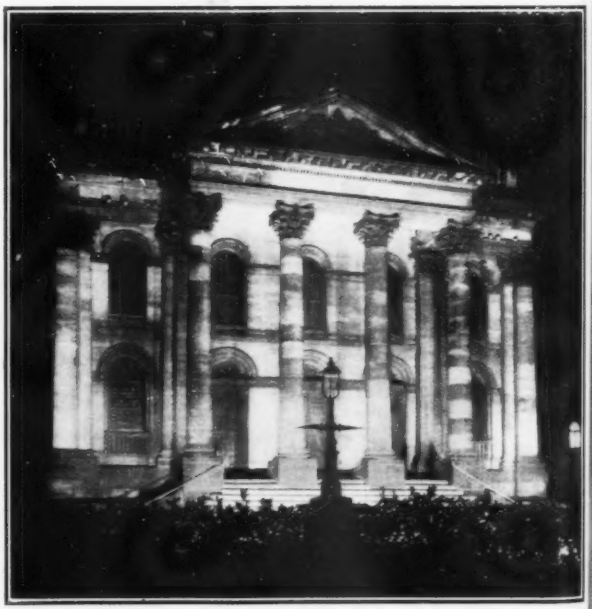
The statutory area at present covers about 75 sq. miles, comprising good class districts offering abundant scope for the expansion of operations owing to their rapid development. The record of the Undertaking is one of continuous growth, new consumers and sales showing a steady yearly increase.

On account of the current year, interim dividends of 3½% and 2½% on the two stocks respectively were paid on Sept. 1.

The authorized capital is £1,618,450, of which there is issued and paid up £1,397,150. The standard price of gas is fixed at 14·8d. per therm. The dividend on the sliding-scale stock may rise or must fall ⅛% per annum for each fall or rise of ¼d. per therm in the "Croydon" area. The present price is 9d. per therm.

Borrowing powers amount to £699,338, *plus* one-half the amount of paid-up capital to be issued in the future with any premiums thereon. Against this there is at present outstanding £570,000 of 5% perpetual debenture stock and £100,000 of 4% perpetual debenture stock. The former is quoted at 125 to give a yield of 4% per annum, and the latter at 100 to return 4%.

Gas Floodlighting at West Hartlepool.



This photograph shows a demonstration of floodlighting which was carried out recently by the Hartlepool Gas and Water Company. The building is Wesley Methodist Church, West Hartlepool, the façade of which is about 70 ft. square. The lamps used were four 10-light and two 12-light strip lanterns supplied by Messrs. Foster & Pullen, Ltd., and the local interest aroused by the demonstrations made the Gas Company feel that it had been well worth while.

MAKING UNIFORM JETS

An Important Advance

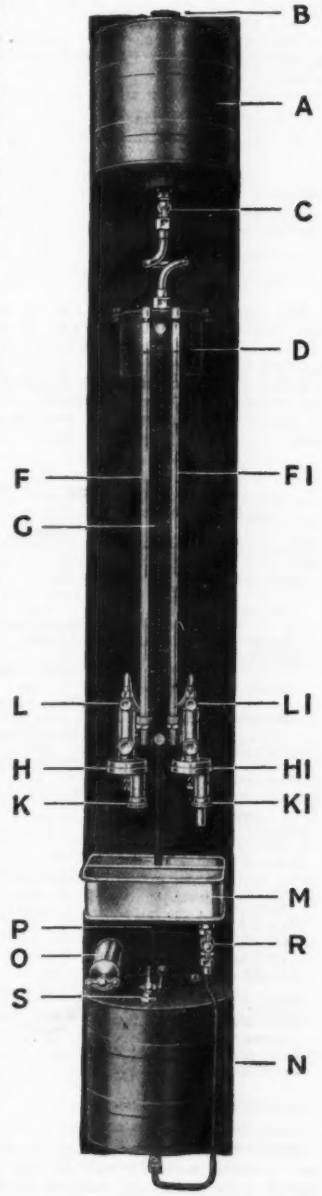
The success of gas utilization depends primarily on efficient combustion, and efficient combustion implies an adequate supply of gas of uniform composition and pressure and a correct air-gas ratio. The Gas Regulation Act of 1920 has gone a long way towards satisfying the requirement of uniform gas, and the logical step is to burn this gas in the best possible way. To our mind the air-gas adjuster—the most general method of dealing with the bunsen type of flame—cannot be regarded as a correct principle. Rather is it a working compromise to mitigate the effects of fluctuations in pressure or density of the gas at the consumers' burners—fluctuations which it should be the aim of the supplier to eliminate. This compromise in practice, however, is not always effective. Either (*a*) the gas-air adjuster is, in fact, not used after a certain setting has been made by the fitter; or (*b*) the consumer is left to play about with what is really a delicate control requiring technical knowledge.

Two things will render the adoption of standard air-gas ratios a simple matter. The first is constant pressure, which may mean the application of governors; the second is the supply of jets which will give within fine limits a known rate of flow. We are concerned in this article solely with the manufacture of jets which will comply with this desideratum.

Recently we were invited by Mr. Harold Binks, a Director of Messrs. Amal, Ltd., Birmingham, to visit his firm's works and to investigate his claim to be able to supply jets of precision; and as a result of this invitation, which we readily accepted, we have come to the conclusion that the claim is quite justified and that the jets made by Messrs. Amal represent an important advance calculated to assist the Gas Industry.

In brief, what Messrs. Amal do is to calibrate jets in terms of petrol flow and then correlate this with gas flow. This correlation is accurate enough for the purposes of the Gas Industry. The jets are numbered according to the number of cubic centimetres of petrol they will pass per minute, and each number corresponds to a definite gas flow at a certain pressure. Charts have been drawn up by the firm so that, if, for example, a gas undertaking requires a batch of jets to give 4 c.ft. of gas an hour, at 2-tenths pressure, all that is necessary is to order by an "Amal Number." None of the jets supplied will vary, and each will give the desired gas flow.

This is no mean accomplishment, and our readers will be interested in a short account of how it is done.



THE CALIBRATING MACHINE.

First, jets of approximate size, and scientifically designed in reference to the length and diameter of orifice, are made by the Morse drill. At the time of our visit several batches of jets—three in each batch—were made in this way. Then each jet was calibrated in a machine devised by the firm, and which is recommended in the B.E.S.A. Specification for the Calibration of Carburettor Jets for Aircraft and Automobile Engines, No. 5030—1925. A modification of this machine—the master jet calibrating machine—and a set of accurately constructed master jets, have been deposited with the National Physical Laboratory as a standard of reference for jet sizes. Reference jets for use with the jet calibrating machines at the Amal Works are certified by the N.P.L.

The instrument is mounted on a backboard. Petrol passes from tank A, through a filter and tap C, to float chamber D; thence through the tube to the body of the instrument, and rises in glass tubes F and F1. The jet to be calibrated is placed in adapter K or K1 and tap H or H1 is turned on by rotating same. The air above the jet is released by means of screws L or L1, and the level of the petrol in F or F1 is read off on scales G. The petrol flowing from the jet is collected through tray M in tank N, and is returned to top tank A, through pipe P, after closing tap R and air release S, by the operation of the pump O. If a jet be now fixed in either of the adapters K and K1, and the corresponding cock H and H1 opened, the petrol in the gauge glass above it will fall to a level varying in accordance with the size of the jet, and it is this level which, when read off on the scale G, gives the calibration of the jet. The two glass tubes and scales are independent for making two tests at once, but if one jet is being tested, the other scale is inoperative. To correct for barometric temperature and density variations, a master jet is used, to which each scale is set. This jet is inserted and the petrol allowed to flow for at least one minute, when the mark on the scale corresponding to the master jet size should register level with the petrol in the glass gauge tube. The master jet is used to set the particular scale which is being used at the time—that is to say, if there is a scale of 20 to 100 on one side, and 100 to 500 on the other, a master jet of, say, 100 c.c. should not be set on the 100 line on the smaller scale, if the larger scale is being used, and *vice versa*. By this means all variations due to temperature, density, &c., are automatically corrected.

"On Test."

The jet, drilled slightly below the required size, is fixed to the adapter of the machine, and is then carefully reamered out to give the required flow and hence the "Amal Number." The reamering is done by girls, who work most skilfully.

From the batches of jets made in this manner we select the following as typical, and the table we set out shows the accuracy and the uniformity of the jets in each batch. The tests for gas flow were carried out in our presence at the Industrial Research Laboratories of the Birmingham Gas Department. The table speaks for itself, and substantiates the claims made by Messrs. Amal.

Results of Tests on Amal Jets.

—	Morse Drill No.	Jet No.	Actual Flow Before Calibration. C.c. per Min.	Calibrated to "Amal Number."	Gas Flow, Corrected to S.T.P., C.Ft. per Hour, Determined by the Birmingham Gas Department.
Batch A .	54	1	240	290	8·91
		2	250	290	8·89
		3	248	290	8·89
Batch B .	53	1	280	300	9·46
		2	298	300	9·45
		3	275	300	9·28
Batch C .	53	1	305	310	9·68
		2	278	310	9·70
		3	278	310	9·69

Fourth Census of Production (1930)

There was published in the "Board of Trade Journal" for Dec. 22, 1932, a supplement (Preliminary Report No. 24) reviewing public services, including Gas Undertakings. The returns relate to certain statutory and non-statutory undertakings, detailed returns not being required from undertakings which employed ten or fewer persons. The figures relate to 676 returns (426 from Companies and 250 from Local Authorities). A comparison is made with the figures for 1924—the year of the Third Census.

Production.

Total Quantity of Gas Produced.—The total quantity of gas made in the year 1930 (inclusive of that used at the gas-works as well as that sold) is shown in the following statement, together with corresponding figures for the year 1924:

	1930. Million C.Ft.		1924. Million C.Ft.
Gas made by Companies	209,226	..	176,955
Gas made by Local Authorities	108,778	..	96,496
Total	318,004	..	273,451

The total production of gas was 16·3% greater in 1930 than in 1924, and of the total quantity made in 1930, Companies were responsible for 65·8%, as compared with 64·7% in 1924.

Undertakings that employed ten or fewer persons in 1924 recorded a total production of 4689 million c.ft., or 1·7% of the total quantity made in Great Britain in that year.

The following table shows the quantities of the chief kinds of gas produced by Companies and by Local Authorities in the two censal years:

Kind of Gas.	1930.		1924.	
	Companies.	Local Authorities.	Companies.	Local Authorities.
	Million C.Ft.	Million C.Ft.	Million C.Ft.	Million C.Ft.
Coal gas	171,668	101,625	140,465	90,020
Water gas and other producer gas	33,069	5,960	36,446	6,476
Other gases produced for distribution	4,309	..		
Not separately distinguished	180	1,193	44	..
Total	209,226	108,778	176,955	96,496

It will be seen from this table that the increased gas production in 1930 was practically confined to coal gas.

While there was little change in the calorific value of coal gas, that of the other gases produced was substantially higher in 1930 than in 1924. The calorific value of gas produced by Companies was about the same in the two years, but that of gas produced by Local Authorities increased by over 3% in 1930 compared with 1924.

Gas Purchased by Supply Undertakings.—All undertakings were asked at the 1930 census to state the quantities bought from authorized undertakings and from other sources, and the information furnished is summarized below:

Gas Purchased.	Quantity in Million C.Ft.	
	From Authorized Undertakings.	From Other Sources.
By producing Companies	189	8,446
By producing Local Authorities	69	3,206
By distributors only (Companies and Local Authorities)	252	1,467
Total	510	13,119

The total quantity of gas purchased in 1930 was thus 13,629 million c.ft. Corresponding information is not available for the year 1924, but the Annual Return relating to all Authorized Gas Undertakings in Great Britain for the year 1924 stated that 623 million c.ft. of gas was sold by authorized undertakings to other authorized undertakings in that year. It would, however, appear from the above figures that the amount of the inter-sales between authorized undertakings represented only a small proportion of the total quantity purchased by gas undertakings in 1930.

Gas Sold.—The total quantity of coal gas, water gas, and other gases sold in 1930 was 309,023 million c.ft., valued at £49,197,000 (Companies: 203,633 million c.ft., valued at £31,861,000; Local Authorities, 105,390 million c.ft., valued at £17,336,000). The value of coal gas and water gas sold in 1924 was £44,999,000 (Companies: £30,163,000; Local Authorities: £14,836,000), but the quantity sold was not obtained for that year. The figures for both years are, however, somewhat in excess of the actual amount distributed for public consumption, since they include a double record of those quantities that were sold by one undertaking to another and distributed by the latter.

The average price per 1000 c.ft. of gas sold in 1930 was, for Companies, 37·6d., and, for Local Authorities, 39·5d. Owing to the absence of information regarding the quantity of gas sold in 1924, comparable figures for that year are not available. It may be noted, however, that in 1930 the quantity of gas sold differed from that made by rather less than 3% in the case of Companies and rather more than 3% in the case of Local Authorities. It is improbable that the proportion sold in 1924 differed widely from that sold in 1930, and, taking the quantity sold as about 97% of that made, the average price per 1000 c.ft. of gas sold in 1924 works out, to the nearest penny, at 42d. for Companies and 38d. for Local Authorities. It seems clear from these figures that there was in 1930 an appreciable reduction in the price per cubic foot at which gas was sold by Companies, but that Local Authorities sold gas at about the same price on the average in the two years. Having regard to the higher calorific value of the Local Authorities' gas in 1930 compared with 1924, there may, perhaps, have been some reduction in the price per thermal unit at which gas was sold in the later year by Local Authorities as well as by Companies.

Coke and Breeze.—The quantity and value of coke and breeze sold by gas undertakings in 1930 and 1924 are shown below:

Gas Coke and Breeze.	1930.		1924.	
	Thou. Tons.	£ 000's.	Thou. Tons.	£ 000's.
Sold by—				
Companies	4827	5553	4804	7,312
Local Authorities	3084	2834	2947	3,699
Total	7911	8387	7751	11,011

The average price per ton of the coke sold by Companies was 23·01s. in 1930 and 30·44s. in 1924, while the average price of that sold by Local Authorities was 18·38s. in 1930 and 25·10s. in 1924.

Other Bye-Products Made for Sale.—The following table shows the values and, where available, the quantities of tar, sulphate of ammonia, &c., made for sale by gas undertakings in 1930 and 1924:

Kind of Product.	1930		1924.	
	Quantity.	Value.	Quantity.	Value.
Tar—				
Crude—		£ 000's.		£ 000's.
Returned in tons	1,371	1,147	Thou. Tons. 639	1,938
Returned in gallons	Thou. Galls. 8,601	81		
Refined—				
Returned in tons	Thou. Tons. 160	482	Thou. Galls. 22,304	458
Returned in gallons	Thou. Galls. 8,555	138		
Sulphate of Ammonia	Thou. Tons 105	584	Thou. Tons. 128	1,327
Ammoniacal liquor	Thou. Butts. 474	11	Thou. Butts. 1,193	132
Tar and ammoniacal liquor, not separately distinguished	..	..	..	39
Tar distillation products—				
Benzole—				
Crude	Thou. Galls. 361	14	Thou. Galls. 1,903	115
Refined	4,357	320		
Naphtha	569	28	570	25
Tar oil, creosote oil, anthracene oil, and other heavy coal tar oils	16,182	284	21,312	617
Pitch	Thou. Tons. 91	196	Thou. Tons. 121	324
Other tar distillation products	..	197	..	365
Other products (including waste products)	..	242	..	283
Total value	..	3,724	..	5,623

While there was a marked increase in the quantities of tar and benzole made for sale by gas undertakings in 1930, as compared with 1924, the output of other residual products was, except in the case of naphtha, substantially less in the later year.

The total number of persons employed in 1930 was about 5% greater than in 1924, the increase in operative staff being about 3% and in the administrative, &c., staff about 14%.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

THE AMMONIA SITUATION IN SWEDEN.

A report of the recent eighteenth general meeting of the Swedish Gas Association appears in "Das Gas- und Wasserfach," 1932, 75, 1036-37 (Dec. 31).

G. H. Hultman discussed the question of methods of dealing with ammonia liquor in the light of the present low selling price of sulphate. The cost of sulphate manufacture at the Stockholm Gas-Works was £6 4s. per ton in 1913, against £6 15s. in 1930. The fact that the increase was so small was due to the expansion of the annual make of sulphate from 600 tons to 2080 tons. Selling prices were £13 5s. per ton in 1913 and £7 15s. in 1930, while in 1931 the selling price of £4 10s. per ton was below the cost of manufacture even if overhead charges (capital, depreciation, and administration expenses) are excluded. In that year, recovery of the fixed ammonia was discontinued since its loss was more than covered by savings in respect of labour and steam. This, in conjunction with a fall in the cost of sulphuric acid, enabled sulphate manufacture to be carried on without loss.

The author then described various possibilities open to gas-works for the manufacture of their own sulphuric acid. By a method proposed by him and tried experimentally at Stockholm, sulphuretted hydrogen in concentrated form was obtained by a liquid purification process. On the assumption that this could be regarded as available free of cost, the cost of the acid required per ton of sulphate could be reduced, at the Stockholm Gas-Works, from the present level of £2 8s. to £1 2s. 6d. When acid has to be purchased, it does not pay to erect a sulphate factory for an annual output of less than 4500 tons. With an existing works in which capital and administration expenses may be neglected, an annual output of 2200 tons may be economical. When acid is obtained as described above, these figures become 1800 and 1100 tons respectively.

Where sulphate manufacture does not pay, liquor may be successfully employed, as in Denmark, for the spraying of fruit trees as a protection against insects. Furthermore, in that country, and more especially in Germany, investigations of the use of diluted liquor as a fertilizer have been made and have given successful results.

Other products, apart from sulphate, may be made from liquor—*e.g.*, concentrated ammonia liquor, pure concentrated ammonia, ammonium chloride, and ammonium bicarbonate. In Sweden, according to the author, concentrated liquor could be produced by the smaller works in cases where it could be sold for fertilizing purposes. Pure concentrated ammonia can only be made by the large works. At Stockholm, there were carried out experiments in which liquor was distilled without liming and the vapours, together with waste gases (as a source of carbon dioxide), were led into a saturator, the precipitated ammonium bicarbonate being collected and centrifuged. There had also been carried out, in 1927, experiments in which coal gas was passed into refrigerated brine, sodium bicarbonate being precipitated. Thereby, with a single wash-bottle, 87% of the ammonia content of the gas was recovered. Based on this, a scheme for the manufacture of soda and ammonium chloride was outlined, and this should now be feasible in view of the present availability of methods for the intensive cooling of gas. The solubility relationships involved were discussed, as were also the economic advantages of the process compared with sulphate manufacture.

NOTES ON PLANT AND PROCESSES

Mechanical Handling Equipment.

A new and comprehensive catalogue has recently been issued by the Underfeed Stoker Company, Ltd., of Aldwych House, W.C. 2, dealing with their mechanical handling equipment; and the information given, embodying the latest material-handling practice, is indicative of the numerous classes of equipment manufactured by the Company.

Well reproduced illustrations show every detail of the many types of plant supplied, while diagrammatic figures and drawings give fuller specifications of the various products.

Among the apparatus dealt with are skip hoists and drag scrapers, standardized for various capacities and travel to handle large quantities of any loose bulk material; the improved "Simplex" loader and skip buckets, such as are used by many gas undertakings for raising coal to the top of vertical retort houses; large coal-handling plants, an illustration showing one recently installed in the North of England to handle coal at the rate of 200 tons per hour. Automatic skip hoists and winders of reliable design and construction are described, with details of apparatus which is particularly recommended for gas-works, an illustration showing one installed at a large modern gas-works for dealing with 70 tons of coal per hour from road vehicles to the retort house, to the store, or from the store to the retort house. This Underfeed-Beaumont winder, in addition to being self-contained with brake and cam limit switch, has all the gears totally enclosed and running in oil. Skip hoist control panels are also described, while an interesting chart gives details of capacities

Cable drag scrapers, such as are used at many gas-works, are described and illustrated, these, used in conjunction with an automatic skip hoist, providing an ideal plant for coal storage. Drag scraper winches are the subject of a further section. Hoppers, coal-unloading equipment, cable excavators, belt conveyors, &c.—all plant which is useful one way or another to the Gas Industry—receive attention in this useful catalogue.

The Underfeed Company will at all times place their specialist experience and facilities at the disposal of engineers with a view to preparing schemes which will most economically and best meet requirements.

"Hygienic" Gas Fires.

The gas fire catalogue which has been forwarded to us by the Hygienic Stove Company, Ltd., of Huddersfield, contains illustrations and full particulars of a very comprehensive range of gas heating equipment manufactured by this progressive firm.

Varying widely in size and design to suit all tastes, "Hygienic" gas fires embody ventilating efficiency with radiant warmth, and can be supplied with "Duplex" burners and taps if desired. Illustrations show examples of lustre finishes, no fewer than twelve different art finishes and eight imitation grained wood styles being standardized by the firm. As all their fires in this catalogue can be supplied in any of these finishes, it is easy to select one that will harmonize with any particular scheme of decoration or furnishing.

Attention is also devoted to gas-heated steamless radiators of the "Hygienic" radiating stove, which is stated to be a most efficient apparatus, with polished copper reflector, ornamental top, base, and front frame, and body of burnished blue steel. The cavity above the burners is filled with hollow fire balls, which collect and maintain a large amount of low convection heat near the floor. A useful table at the end of the publication explains how to decide upon the size of fire to install in ordinary living rooms under normal conditions.

The Hygienic Stove Company, Ltd., are also extensive manufacturers of wash-boilers, gas-heated boiling vats, pans, steamers, and other apparatus for a variety of industrial and culinary purposes. "Hygienic" gas wash-boilers have been designed for hard wear, general utility, and good service, and can be supplied with the cast tops and flue pipes finished in a mottled porcelain enamel, while the casings of some sizes and patterns of sheet-cased boilers can also be enamelled. The boilers are also made with the tops and other cast mountings in a high-grade alloy of aluminium.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Combustion of Solid, Liquid, and Gaseous Industrial Fuels*

By H. L. PIRIE, M.I.Mech.E.

The laws governing combustion are the same for all fuels, and as the efficiency of combustion is generally gauged by the quantity of excess air used, computed from the volumetric percentage of CO_2 in the flue gases, it is necessary to be familiar with the procedure adopted in ascertaining the maximum theoretical quantity of CO_2 obtainable.

There is a widespread but erroneous belief that the maximum figure is 21%, but this is true only in the case of pure carbon burned in air, and is *not* applicable to industrial fuels. All such fuels contain more or less "available" hydrogen, and since this hydrogen will burn to water vapour, which condenses in an Orsat apparatus, the complement of oxygen in the air supplied to the fuel for the combustion of the hydrogen will not appear in the Orsat measurement, but its nitrogen equivalent *will* appear. Hence as the apparatus measures the volume of CO_2 relative to the total volume of N_2 supplied, it follows that the *maximum theoretical CO_2 will vary with and be dependent upon the chemical composition of the fuel.*

Consider the following case of producer gas:

	%	
Carbon monoxide (CO)	28	Combustibles
Hydrogen (H_2)	14	Combustibles
Methane (CH_4)	1	Combustibles
Oxygen (O_2)	1	Non-combustibles
Carbon dioxide (CO_2)	4	Non-combustibles
Nitrogen (N_2)	52	Non-combustibles
	100	

On supplying oxygen and writing equations (*a*) and (*b*) in the "half molecule" form:

(*a*) $CO + O = CO_2$
(*b*) $H_2 + O = H_2O$
(*c*) $CH_4 + 2O_2 = CO_2 + 2H_2O$

It will be seen that—

(i.) 1 molecular vol.† CO unites with ½ m.v. O_2 to give 1 m.v. CO_2.

(ii.) 1 molecular vol. H_2 unites with ½ m.v. O_2 to give 1 m.v. H_2O.

(iii.) 1 molecular vol. CH_4 unites with twice its vol. O_2 to give 1 m.v. CO_2 and 2 m.v. H_2O.

Hence with the *Producer Gas* under consideration the *volume of the products of combustion* will be

				H_2O.	CO_2.	N_2.
CO	28 vols.	+ 14 vols.	O_2 yield	..	28	— vols.
H_2	14 ,,	+ 7 ,,	,,	14	..	— ,,
CH_4	1 ,,	+ 2 ,,	,,	2	1	— ,,
O_2	1 ,,	− 1 ,,	,,	..	..	— ,,
CO_2	4 ,,	— ,,	,,	..	4	— ,,
N_2	52 ,,	— ,,	,,	..	..	52 ,,
	100 vols. gas	+ 22 vols.	O_2 yield	16 vols.	+ 33 vols.	+ 52 vols.

The volume of air required for combustion

$$= \frac{22 \times 100}{21} = 105 \text{ c ft.}$$

The volume of N_2 added with the air	105 − 22 =	83 c ft.	
The volume of N_2 in products	83 + 52 =	135 c.ft.	
The volume of dry products	CO_2	N_2	
	33 vols.	135 vols.	
	24·4%	75·6%	
	100%		

In this case, then, the maximum CO_2 obtainable is 24·4%.

Producer and other industrial gases vary greatly in composition, and hence the analysis of the particular gas under consideration must be known before the theoretical CO_2 percentage can be found. However, it may be stated that in the case of blast furnace gas it may be as high as 27%; with coke oven gas it is only about 7%, while with fuel oil the maximum possible is in the region of 15% and with British coals it is between 17 and 19%.

Effect of Excess Air.

Assume a blast furnace gas having the following composition:

	%	
CO	30	(A)
H_2	3	(A)
O_2	1	(A)
CO_2	8	(B)
N_2	58	(B)
	100	

If the foregoing reasoning be applied it will be found that on ideal combustion—*i.e.*, without any excess air—154 volumes of products are obtained from 100 volumes of the gas whence the maximum CO_2 obtainable is 24·7%.

If the actual CO_2 obtained in the chimney gases by Orsat measurement is 22% this signifies that 22 volumes CO_2 are contained in 100 volumes of products and 38 volumes (A) + (B) of CO_2 are contained in $\frac{100 \times 38}{22} = 173$ volumes—*i.e.*, every 100 vols. gas yield 173 vols. products, but with ideal combustion 100 vols. gas yield 154 vols. products, so that excess air per 100 volumes = 173 − 154 = 19 vols.

Gaseous Fuels.

Industrial gases always contain more or less moisture, and its presence modifies their physical properties.

Its effect at high temperatures on the calorific value is very marked and it is curious how this moisture content complicates calculations. In some experiments on blast furnace gas, which will presently be referred to, it was found that the average dew point was 122° F. (50° C.). It is interesting in this connection to follow the change which unit volume of dry air (the weight of unit volume of the blast furnace gas and air is practically the same) at normal temperature and pressure (0° C. and 760 mm. mercury) undergoes in heating at constant pressure to dew point with simultaneous saturation with aqueous vapour.

Taking the norme as 1 cubic metre of dry air at N.T.P. this will expand, according to Gay Lussac's Law, by $\frac{1}{273}$ of the volume which it occupies at 0° C. for every degree rise in temperature. Therefore at 50° C. its volume will become $1 + \frac{50}{273} = 1{\cdot}1840$ cm.* As 1 cub.m. of dry air at N.T.P. weighs 1·293 kg. at 50° C., 1 cub.m. will contain $\frac{1{\cdot}293}{1{\cdot}1840} = 1{\cdot}0925$ kg. dry air.

Now at 50° C. the maximum pressure of aqueous vapour is 92 mm., and according to Dalton's Law of partial pressures, which states "The total pressure of a mixture of gases or vapours which have no chemical action on each other is equal to the sum of the pressures which each would exert separately if it were alone in the space occupied by the mixture:"

The total pressure of the air/vapour mixture will be	760 mm.
The partial pressure due to the water vapour will be	92 ,,
Therefore the partial pressure due to the air will be	668 mm.

so that under these conditions 1 cub.m. of the mixture will contain only $\frac{1{\cdot}0925 \times 668}{760} = 0{\cdot}962$ kg. dry air.

Again, 1 cub.m. of dry air heated at constant pressure from N.T.P. to dew point and with simultaneous saturation with water vapour becomes $\frac{1{\cdot}293}{0{\cdot}962} = 1{\cdot}345$ cub.m. saturated air.

As the density of water vapour at any temperature under which it can exist is some 62½% of that of an equal volume

* From a paper before the East Midlands Section of the Institute of Fuel, Nottingham, Dec. 9.

† See Appendix.

* All calculations have been made on the slide rule.

of dry air under the same temperature and pressure, it follows that a cubic metre of saturated air must weigh less than a corresponding volume of dry air, but when dry air takes up moisture its weight is increased by the amount of vapour added; at the same time its expansive force and consequently its volume is increased, so that in the result a given volume of air weighs less when it is saturated than when it is dry.

The foregoing being scientific calculations worked out from first principles, metric units have been employed, but as 62° F. and 29·92 in. mercury are generally regarded as being standard conditions in practical blast furnace work, subsequent calculations in British units have been referred to that base.

The gas in question had the following composition:

	A.	B.	C.	D.
CO	25	× 0·0763 = 1·909	× 322 = 8050	× 0·019 = 0·475
CO_2	14	× 0·1167 = 1·635	..	× 0·026 = 0·364
H_2	4	× 0·0053 = 0·021	× 274 = 1096	× 0·019 = 0·076
CH_4	trace	..	..	..
N_2	57	× 0·0737 = 4·2	..	× 0·109 = 1·083
	100 (c ft)	7·765	9146	1·998
∴ 1 c.ft.		= (say) 0·077	(say) 92	(say) 0·02

A = volumetric percentage of composition of gas at N.T.P.
B = weight of 1 c.ft. of constituent gases.
C = calorific value B.Th.U. per c.ft.
D = specific heat per c.ft.

The norme is taken as the amount of this raw blast furnace gas which after being reduced by the law of perfect gases from the conditions of measurement at 400° F. to standard conditions (62° F. and 29·92 in. mercury) becomes 1 c.ft.

At dew point the weight of water vapour in the mixture is 0·0051 lb., representing about 12% by volume or 8% by weight, so that the quantity of dry gas in the mixture is 88% and 92% by volume and weight respectively.

Moisture displaces dry gas upon which the heat value is always based, consequently a deduction must be made in proportion to the quantity of vapour in the mixture. On the other hand, the raw gas contains considerable sensible heat due to its high temperature, and this quantity must be calculated and added.

By Gay Lussac's Law 1 c.ft. at 122° becomes 0·9 c.ft. at 62°.

Hence the moisture content at N.T.P. $\frac{0{\cdot}0051}{0{\cdot}9} = 0{\cdot}0056$ lb.

B.Th.U./c.ft. of the dry gas at N.T.P. = 92.

B.Th.U./c.ft. of the dry gas corrected for space occupied by moisture = 81.

B.Th.U./c.ft. of the dry gas corrected for sensible heat between 62° and 400° = $81 + \{0{\cdot}88 \times 0{\cdot}02\ (400 - 62) + 0{\cdot}0056 \times 0{\cdot}48\ (400 - 122)\} = 88$.

It is evident from the foregoing that before an accurate comparison can be made with coal all data relative to blast furnace and other industrial gas fuels must be known and taken into account.

Blast Furnace Gas.

When air is introduced into a blast furnace charged with iron ore (Fe_2O_3), limestone ($CaCO_3$), and coke (C), its oxygen unites with the carbon of the coke. Subsequently the carbon monoxide so formed reacts as follows:

$$3CO + Fe_2O_3 = 3CO_2 + 2Fe.$$

Other reactions, such as FeO + C = Fe + CO, also take place.

Although in times of depression blast furnaces have been worked with the object of producing slag for road-making or gas for generating power—iron being the bye-product—in the ordinary course of events furnace managers endeavour to operate their furnaces so as to give a high CO_2 : CO ratio with a low top temperature. Such conditions are the reverse of what the boiler engineer would like, but it must be remembered that normally the primary function of the blast furnace is to produce pig iron economically and not necessarily to generate high-grade gas.

A furnace producing 1000 tons per week and using 20 cwt. coke per ton of iron will generate something in the region of 150 million c.ft. of gas, equivalent to $\frac{150{,}000{,}000 \times 86\ (\text{B.Th.U.})}{2240 \times 12{,}000\ (\text{B.Th.U.}) \times 7} = 68$ tons of coal per day, about 50 to 25% of which will be surplus, according to whether gas or steam engines are used for supplying the blast.

Producer Gas.

Thanks to the sustained efforts of Mr. T. Roland Wollaston, of Manchester, great strides have recently been made in the application of producer gas for firing steam boilers. Probably the best application of Mr. Wollaston's principle is to boilers of the vertical or locomotive types where the producer and boiler shells form an integral unit, thus enabling the internal producer loss due to the formation of CO to be largely utilized. The producer is also constructed to work in conjunction with narrow flue internally fired boilers, being arranged as a separate unit in front of the boiler in such a way that it may be easily withdrawn if and when access is required to the furnace.

It is pointed out in literature dealing with the subject that the various mechanical devices for improving the efficiency of Lancashire and such-like boilers are an effort to make a bad thing do a little better. To this statement the author subscribes, as in his opinion (so often expressed), the design of narrow flue internally fired boilers is fundamentally wrong for the combustion of solid fuel other than anthracite, coke, or other smokeless fuels.

He accepts, however, with reserve, the inference to be drawn from a high CO_2 flue gas content when compared with that obtained from solid fuel.

Coke Oven Gas.

Developments may be looked for in the wider industrial application of this fuel in the near future.

After having passed through scrubbers, exhausters, coolers, &c., bye-product coke oven gas is saturated with moisture and also contains a large proportion of hydrocarbon gases. It varies considerably in composition during the carbonization process, but where a large number of ovens are charged and pushed in rotation the average quantity and quality are reasonably constant. The following is a typical analysis:

CO_2	trace
CO	4%
CH_4	30 ,,
H_2	50 ,,
N_2	16 ,,

This is similar to town gas; the calorific value is also similar, being from 450 to 500 B.Th.U. per c.ft. About 10,000 c.ft. is obtained from one ton of coal, some 50% of which is normally available for steam raising.

Waste Gases from Metallurgical Furnaces.

Much valuable data regarding the firing of waste-heat boilers has been published in recent years. The Institute of Fuel was fortunate in having a most interesting paper by Major Gregson—one of the foremost authorities on the matter—some time ago.

While the knowledge of the subject has considerably increased since the following figures were obtained from a water-tube waste-heat boiler, interposed between an 85-ton open hearth furnace and its stack, the data given may prove useful to those engaged in similar investigations:

Duration of heat	12·9 hours
Weight of steel tapped	87·1 tons
Total coal to producers	47,418 lbs.
Coal per ton of steel	545 ,,
Water evaporated from and at 212° per hour	9 456 ,,
Lb. of water per ton of coal charged to producers per hour	5,760 ,,
Lb. of water per ton of steel per hour	1,390 ,,

Although these gaseous fuels are competitive with coal, it must not be forgotten that coal is the raw material from which they are made. It is useless to try to impede progress by detracting from their use. The reduction in price of the commodities manufactured by their employment should result in increased demand. Consequently, more coal should be required in the industries concerned.

Calculation of Volume of Gas Produced.

The direct measurement of hot, raw, industrial gases presents difficulty on account of dirt, dust, tar, &c. It is, therefore, convenient to be able to calculate roughly by means of a "Carbon Balance" the volume of gas produced from a given weight of fuel. In blast furnace work this is simple, but the factors involved in the consideration of producer gas render the result less reliable.

The volume of gas generated in a blast furnace from the fuel in c.ft. per ton of iron = $\frac{W \times C_1}{C_2 \times K}$ where

W = lbs. of coke consumed per ton of iron produced.
C_1 = percentage of carbon in the coke.
C_2 = the sum of the volumetric percentage of the carbon gases in the blast furnace gas.
K = a constant = 0·032, which is the weight in lbs. of carbon in 1 c.ft. of any gas at 62° F. and 29·92 in. barometer, in which there is one carbon atom per molecule.

In the case of producer gas the steps are as follows:

(*a*) Analyze the coal for its carbon and ash contents.
(*b*) Calculate the carbon content per ton of coal.
(*c*) Determine the moisture and unconsumed carbon in the producer ash.
(*d*) Ascertain the quantity of unburned carbon per ton of coal.

(*e*) Measure the tar yield and its carbon content and from this calculate
(*f*) the loss of carbon per ton gasified.
(*g*) Find the quantity of carbon which should appear in the gas = (*b*) − { (*d*) + (*f*) }
(*h*) Analyze the gas.
(*j*) Calculate the amount of carbon per 100 c.ft. of gas.

Then $\frac{(g)}{(j)} \times 100$ = c.ft. gas produced from 1 ton of coal.

The errors of observation necessarily involved must result in some inaccuracy, but if the determinations are carefully made the result will probably be as reliable as that obtained from direct meter readings.

Liquid Fuel.

If it is difficult to fire a heavily loaded tubular furnace boiler with bituminous coal without producing smoke, it is infinitely more difficult to do so with oil fuel. Unless the furnace is specially designed for burning oil, having appropriate combustion space, trouble is likely to be experienced from incomplete combustion. So many oil fired boilers are simply converted coal fired jobs having burners in place of grates that this explains why the use of fuel oil has so often led to disappointment.

With properly designed combustion chambers the boiler efficiency with oil may be high, but with improper design it is little better than, if as good as, with coal.

Oil in inexperienced hands is not so flexible as coal. It is frequently difficult to cut down the air supply sufficiently on light loads so as to obtain high CO_2 without producing smoke.

The temperature and pressure of the oil at the burners, as also the regulation of draught, are most important.

If the oil is below a certain temperature it will atomize coarsely, but will not burn properly. A cake of carbon is formed in the flue which is likely to upset evaporation figures until it is removed. If the flame impinges upon any metal work, high evaporation will occur at the points of contact, which is likely to cause heavy scaling and ultimate bulging due to the local heating.

Varying loads are taken care of by adjusting the oil and air supply and the main damper. These should be correlated to give just a trace of smoke.

Striking pillars in the flues frequently improves combustion conditions.

Fuel oils vary in their composition much in the same way as coal, but the following may be taken as being a representative analysis:

Carbon	84%
Hydrogen	12 ,,
Sulphur	4 ,,
Calorific value	about 18,500 B.Th U. per lb.

The fuel ratio of oil to coal is about $1\frac{1}{2}$: 1, so if the tonnage price of both fuels is known the equation of cost is easily ascertainable.

Fuel oil has certain advantages, the principal, other things being equal, being that fires do not have to be cleaned nor ashes removed.

Appendix.

The term "molecular volume" indicates 22·4 metres of any simple gas at 0° C. and 760 mm. mercury, and the weight of this volume of gas is equal in gramme molecules to the molecular weight of the gas.

It is customary in this connection to regard a molecule of gas as occupying at N.T.P. the same volume as two atoms of hydrogen.

It is perhaps a little absurd to speak of writing an equation in the "half molecule" form, but this method is frequently employed for convenience.

The figure 22·4 litres is derived as follows: At N.T.P. one litre of hydrogen weighs 0·0896 gramme, therefore 1 gramme of hydrogen under standard conditions occupies 11·2 litres.

Avogadro published his Law in 1811, which stated: "Equal volumes of different gases under the same conditions of temperature and pressure contain the same number of molecules."

Subsequently Clerk Maxwell amplified this: "If equal volumes of two gases at the same temperature and pressure contain the same number of molecules, the masses of the two kinds of molecules are in the same ratio as the densities of the gases to which they belong."

Now 22·4 (2 × 11·2) litres of hydrogen at standard conditions weigh 2 grammes, but 2 is the molecular weight of hydrogen expressed in terms of the gramme, so this number is termed a gramme molecule of hydrogen. If, therefore, we ascertain the weight of 22·4 litres of any other gas under the same conditions of temperature and pressure the gramme molecule of the gas is obtained. Thus:

22·4 litres hydrogen	weigh	2	grammes	
,, oxygen	,,	32	,,	
,, carbon dioxide	,,	44	,,	, &c.

Gas in Industry*

By E. Strother Davies, of the Industrial Department of the Bristol Gas Company.

General trade depression and keen competition, varied in character, have to be countered if we are to retain and increase our industrial sales. Our customers, the manufacturers, to cope with competition, must reduce their production costs to a minimum. In many trades heat treatment forms an important part of these costs, and the manufacturer may be faced with reducing his heat treatment costs or losing orders. If unable to get down to an economical figure with his present fuel, he naturally considers whether he can do better with another. Where the present fuel is town gas, we must see that it is being sold at our best terms and consumed in such a manner as to give the highest efficiency. We are handicapped in our methods of charging by obsolete legislation, but, fortunately, there are no such restrictions on the extent of service we may render to the consumer.

During several years' experience as an industrial salesman, I have come across cases where, although it has not been possible to reduce the price of gas, savings as much as 50% have been effected in heating costs by increasing the effective use of the gas consumed. I do not suggest such conditions are common; nevertheless there is generally much scope for introducing economy. The consumer learns to compare the cost of fuel, not by weight, measure, or heat units, but by the service it performs. If we are out to do business with the manufacturer, we must obtain and maintain a closer relationship than has existed in the past. We must find out what he uses gas for, and not be content to know that the service and meter are capable of meeting the maximum demand. We must be in a position to advise him whether he is using gas in the most efficient manner, and if not, to show him how to do so. By so doing we can consolidate our position and pave the way for progress.

With a few recognized exceptions, our knowledge of the industrial application of gas is limited. The attention focussed on this subject of late, however, gives rise to the hope that improvements are being effected. I think it is true to say there are gas undertakings who know less of this subject than the consumer who uses the gas. The consumer realizes this and does not consult them when considering questions of heating. Instead, he goes to the furnace manufacturer, who may, or may not, advise gas equipment. It is strange, but true, that in some towns the furnace manufacturer gets little encouragement from the local undertaking to push gas in preference to any other fuel. So long as these conditions exist, such undertakings must not be surprised if they find decreases where they hoped for increases. I do not suggest the furnace maker has a bias in favour of other fuels. He has to look for repeat orders, so must recommend that which he considers likely to give the best service. Much depends on the price of gas and the policy of the local undertaking. The success of our industrial load is in no small measure due to the assistance of the furnace maker.

A Staff of Trained Specialists.

It would be interesting to learn what progress is being made to give effect to the suggested scheme for developing the use of gas for industrial and commercial purposes, as laid out in the memorandum issued by the National Gas Council some time ago. I believe that unless we can speedily build up a staff of trained specialists sufficient for our requirements, our competitors will have left us far behind. Training at the various centres, as suggested by the N.G.C., would, in my opinion, be too lengthy a process to be effective. The central industrial demonstration room, as suggested, would no doubt serve a useful purpose, not so much for displaying apparatus as for carrying out special experiments.

Bristol's Industrial Department.

You may be interested in what the Bristol Gas Company are doing to consolidate and increase the use of gas for industrial and commercial purposes. Our Industrial Department, as a specialized branch of the Company's activities,

* From a paper read before the Western Junior Gas Association, Dec. 13, following a visit to the Tobacco Factory of Messrs. W. D. & H. O. Wills, Bristol.

is of recent formation. The personnel at present consists of three industrial specialists and one assistant. We have no display or demonstration room, although I believe it is a matter which is receiving the consideration of the Management. The trades of the city have been classified, and each is receiving attention in turn. Before making a call upon any consumer, a letter is sent drawing attention to our new Department and offering to make a survey of apparatus, give a report, and carry out any adjustments free of charge. A reply post-card is enclosed. The scheme has been well received, particularly by the larger consumers, and we are rarely refused admittance. On the reply card the consumer is asked to fill in the name of the official for whom we inquire when paying our call. During the visit a census is made which includes service, meter, gas, oil, electric, and solid fuel apparatus. Thus, in addition to a record of the gas equipment, we have full particulars of the potentialities for increasing business. The gas apparatus, wherever possible, is inspected under working conditions, and we endeavour to fix up a periodic maintenance visit, for which a charge is made. Anything which calls for special attention is made the subject of a report.

Quarterly, and in some cases half-quarterly, gas consumptions showing the corresponding period of previous year, are received from the Head Office, so that we are able to keep a close check on any abnormalities. Weekly reports are submitted to the Head Office showing progress made. Our industrial side covers nearly 100 different trades. These comprise over 1000 manufacturers, in addition to a large number of commercial users as distinct from manufacturers. Thus there is tremendous scope for our activities.

By closer co-operation and service, good progress has already been made in putting ourselves in a better position to meet competition. Incidentally, the orders received for additional apparatus have been most encouraging.

Comparisons.

The control of temperature is undoubtedly dependent on pressure. I think that in the Gas Industry this point is unfortunately treated too lightly. No appliance can be expected to work efficiently where there is fluctuation of pressure at different times throughout the day. I believe that the time is coming when each appliance will be fitted with governor control. Oil gives a more constant pressure, due to the fact that it is fed by gravity to the burner; but this again is dependent on the constant quality of the oil.

Electricity, although not so uniform, maintains a fairly constant supply; but failures result in considerable losses.

Gas has a tremendous advantage in regard to atmosphere. Any atmosphere can be obtained with comparative ease, which, with oil, would necessitate careful adjustment.

Electricity has no claim whatever, producing only an oxidizing atmosphere, although in order to create a different atmosphere, the use of a gas shield in front of furnace doors has been resorted to.

Electricity, as an industrial heating unit on a large scale, although it may eventually be sold at a cheaper rate, will not, in my opinion, be our chief competitor; our greatest rival is undoubtedly fuel oil.

During the past few years oil has made rapid progress as a heating agent. So far its success has been mainly at the expense of solid fuel. There is, however, no disguising the fact that it is slowly, but none the less surely, eating into our industrial load.

In Bristol it is chiefly used for steam raising and central-heating purposes. Doubtless some of this business has been won over from coke. Preference is not necessarily given because it is considered a better fuel. The question of price is the chief factor, although, as pointed out, for some purposes it has definite advantages over any solid fuel.

Although the sale of coke is not part of our duties as industrial salesmen, a close working arrangement exists between our Coke Sales and Industrial Departments. Wherever we find coke in danger of being superseded by another fuel, information is immediately passed to the proper quarter for attention. Likewise, where coke is considered to offer better service than gas, the Coke Sales Department is notified.

In order to give a comparison of costs, I will give the result of a test carried out on similar furnaces used for forging turbine blades at a temperature of 1200° C., one being fired with town gas and the other with fuel oil.

—	Gas.	Oil.
Total fuel used including heating up to working temperature	49,880 c.ft.	355 galls.
Weight of steel heated	7,734 lbs.	7512 lbs.
Consumption per 1000 lbs.	6,449 c ft.	47·3 galls.

Thus in order to compete successfully for this work with oil at approximately 3½d. per gallon, gas must be sold at approximately 2s. 1d. per 1000 c.ft.

Producer Gas.

Producer gas is a serious competitor to any fuel where a large quantity of heat is required. This gas can be manufactured at 3¾d. per therm, including all charges, and, as previously stated, it has most of the advantages of town gas.

The modern producer plant gives little trouble in use. The gas, purified with oxide, can be used in open furnaces for the most delicate heat-treatment operations of steel. You may be interested in a few particulars of a popular make of producer plant.

Anthracite is the fuel used, and the gas is produced by suction of air and steam through the fuel bed. The necessary steam is produced in a waste-heat boiler built round the outlet pipe from the generator. Gas passes through a water scrubber and oxide purifier and is compressed on to the point of use at 3 lbs. per sq. in.

The gas produced averages about 145 B.Th.U. per c.ft. The purifying material only requires changing about three times per annum, and with this particular type of plant it is possible to install a gas and air mixing machine. This permits of town gas being used when the consumption does not warrant starting up the producer, or in case of a breakdown or overhaul of the plant.

The gas and air mixer reduces the calorific value of town gas to that of producer gas, and the two gases can be used jointly should the demand exceed the capacity of the producer plant.

The following are actual working costs of a plant such as described, taken in a factory over a period of 84¾ hours. In this particular case the price of electricity was ¾d. per unit, water 4½d. per 1000 gallons, and coal (on works) 40s. per ton. Purifying material at 67s. per ton is included in the labour item. The heating value of the gas produced was approximately 145 B.Th.U.:

Test of Producer Gas Plant.

Number of hours in use, 84¾.

Totals.			Hourly Average.	
Gas produced	1,623.550 c ft.	..	Gas	19,156·93
Electricity used.	964 units	..	Electricity	11·37
Water used	48,720 galls.	..	Water	574·86
Coal used	182½ cwt.	..	Coal	2·15

Hourly cost of coal, current, and water	5s. 3d.
,, ,, labour	1s. 10d.
,, ,, depreciation	1s. 1d.
	8s. 2d.
= per 1000 c ft. (145 B.Th.U.)	5·11d.
= ,, therm	3·52d.

I have no doubt these plants can be designed to use coke instead of anthracite, but I have no information as to the costs of this.

Two points which occur to me at the moment are:

(1) To give the same output with coke, presumably a larger generator would be necessary, or labour costs would be increased.

(2) Although the volatile matter in coke is generally less than in anthracite, coke appears to require additional scrubbing plant to deal with the tar content.

As a salesman, I believe the future of our industrial load depends as much on service as on cost per therm. The benefits of a low price can be nullified by lack of, or indifferent, service. Having sold our gas it requires good service to keep it sold.

My interpretation of good service is a policy which will ensure:

(1) Expert advice to the consumer on all matters relative to heating and heat treatment, including the design and, where advisable, construction of apparatus to suit special requirements. Standard apparatus is not always cheapest or most suitable. Much gas is at present wasted through using apparatus not suitable for the particular process.

(2) Carrying out tests and instructing in the most economical methods of operating. This is particularly essential where trade conditions do not permit of the apparatus being used at its full capacity.

(3) An organized maintenance system. No matter how efficient apparatus may be when first installed, only periodic maintenance can keep it so. Constant wear and tear speedily reduces the efficiency and thus increases the cost of the process. The job of the operator is made more difficult, and probably, in his attempt to help matters, consumptions are further increased without obtaining the desired result.

(4) That any new equipment has the approval of the operator. Many improvements have been condemned because they did not have the goodwill of the worker.

You will note that in the suggestions I have put forward much would depend on the ability and tact of the industrial salesman. It is not, however, in my province to discuss the education and training of suitable men. I do not believe it is beyond the resources of our Industry to produce sufficient men properly to tackle this work. The important point is, how quickly can it be done?

APPENDIX.

Gas in the Tobacco Industry.

Chief interest in this meeting has been centred on our visit to Messrs. W. D. & H. O. Wills, Ltd., and a brief outline of the use they make of town gas will, no doubt, be of interest after what you have seen during your tour this afternoon.

The first process in the manufacture of tobacco is known as "stoving," a very old practice. The tobacco is spread out over steel slabs by hand, and subjected to high temperature in order to produce "burnt tobacco." Gas is now used as the heating medium, having replaced coke and charcoal for this work. The burners consist of surface combustion diaphragms which produce evenly distributed heat and prevent direct flame contact.

The next operation is known as the "drying process," and requires careful control of heat. The plant consists of heated rotary drums set at an angle, through which the tobacco is conveyed. Previously these were all heated by means of steam pipes, but recently a number have been converted to gas. The burners are also surface combustion diaphragms and consist of eighteen burners to each drum, with a total maximum consumption of 300 c.ft. per hour. Smaller drums are heated by means of bar burners.

Another process in which gas is used is the sealing of tobacco tins. Here the tins are conveyed by travelling chains through a gas-heated solder bath, in such a way that only the part requiring solder is in contact. Hand soldering irons heated by high-pressure gas are also used for repairing leaky tins.

We have recently been successful in increasing the gas equipment at these works by the installation of a furnace for hardening and annealing of steel parts for machinery. This furnace, which was constructed by Messrs. British Furnaces, measures 24 in. wide by 48 in. deep by 12 in. high. It is fired by means of eight surface combustion burners, four on each side, with the flames playing on refractory material. The gas is supplied at ordinary town pressure with air at a pressure of 1 lb. per sq. in.

The equipment is fitted with an inspirator which automatically maintains a constant and correct proportion of gas and air at all pressures in the mixture supplied to the burners. Any atmosphere can be obtained, which, once adjusted, is automatically maintained.

A test carried out on this furnace, while empty, resulted as follows:

Temperature raised from atmospheric to 1000° C. in 90 minutes with a gas consumption of 2300 c.ft.

The following are particulars of three new additions to our industrial load:

Enamelling of Wooden Handles.

One of our consumers has started a special department for the purpose of making and enamelling wooden handles, a process which I understand is the first of its kind in this area.

The enamelling is carried out in a treble-cased drying oven, 6 ft. square by 6 ft. high, fired by four bar burners. The working temperature is 250° F., and this is maintained by a Drayton control. The maximum gas consumption is 500 c.ft. per hour, and the oven is capable of enamelling 3000 handles per charge.

Type-Metal Melting.

Gas is extensively used for numerous purposes by the Press, and recently we have installed a 3½ ton capacity Pony autoplate machine for type-metal melting.

The principle of firing is by means of tunnel burners which play the flame on to refractory chippings. This radiates the heat to the pot, producing an even distribution, and preventing direct flame contact. Two tests have been carried out on this plant, before and after insulation, and the results show how necessary it is, if high efficiencies are to be obtained, to ensure that all exposed parts, where possible, are insulated. [The results are in next column.]

It will be noticed that in this case a big saving was effected during stand-by periods, when the metal was kept molten by means of a pilot jet.

There are several lead manufacturers in our area, and we are at present carrying out tests on a 20-cwt. solid-fuel melting furnace we have converted to use town gas.

Results Over a Period of Seven Days.

—	Unlagged Furnace.	Lagged Furnace.
Total weight of metal cast	56,286 lbs.	69,930 lbs.
Total gas used	26,640 c.ft.	29,600 c.ft.
C.ft. per lb.	0·473 ,,	0·42 ,,
C.ft. per ton	1059·5 ,,	940·8 ,,
Working temperature	650° F.	650° F.
Main burners on	25½ hours	21½ hours
Pilot ,, ,,	142½ ,,	146½ ,,
Temperature maintained by pilot (average)	480° F.	515° F.

Increased efficiency due to insulation = 11%.

If our efforts on this small furnace are successful, we shall have opened the door to a substantial load.

Discussion.

The President (Mr. G. C. Gunston, Bristol) said that at Bristol they realized the importance of the industrial load, and six months ago had formed an Industrial Section, of which Mr. Davies was a member.

Mr. K. L. Clark (Weston-super-Mare) asked what influence calorific value had in the use of gas for industrial purposes, and what was the effect of a change in specific gravity.

Mr. S. Hole (Bath) said he noticed that Mr. Davies did not altogether favour a fuel comparison upon a thermal basis, but a prospective customer knowing something of fuels would surely make this an item of first consideration. As a matter of interest, he had some figures showing the relative costs per therm for solid, liquid, and gaseous fuels under local conditions: Bath gas, 5½d. per therm; Bath coke, 1·023d. per therm; three grades of anthracite varied from 1·44d. to 1·802d.; two grades of fuel oil, 2·64d. and 2·42d. The disparity in first costs was very great. The author had mentioned that oil had a high flame temperature, and that this would be a disadvantage. It would seem that oil had distinct limitations of use.

Mr. W. M. Paterson (Bath) said there was practically no industrial load in Bath, and that the only competition from oil was in central heating and steam raising plants. He assumed that in these cases a direct comparison of costs on a thermal basis between gas, oil, and coke could be taken from the respective calorific values and boiler efficiencies. What figures would Mr. Davies recommend on which to base these comparative costs?

Mr. B. G. Hawkins (Plymouth) asked for information on the use of regeneration and recuperation in furnaces.

Mr. R. J. Kirkcaldy (Gloucester) asked what Mr. Davies' experience was in the use of gas for brass melting, which, he considered, held promise of a considerable load.

Mr. Davies, in reply, said that where temperature control was essential to within 5° to 10° C. any variation in C.V. or specific gravity would upset the working of the appliance. Generally, a high C.V. was preferable to a low C.V. owing to the fact that higher flame temperatures could be obtained, resulting in quicker heat transfer to the load, and better control of temperatures. He hoped that he had not been misunderstood regarding the comparisons on the thermal basis. Cost per B.Th.U. would no doubt be first consideration, but what he meant to imply was that the consumer would learn to compare the cost on the service given and the quality of work produced. In the example of the forge furnace mentioned in the paper, although gas was dearer per B.Th.U. used it was cheaper when based on an all-in cost of the work turned out. Thus in heat treatment processes, for example, the costs must also be taken on the results obtained as well as on the comparative B.Th.U. input. With oil it was much harder to obtain a required atmosphere and the repairs to oil furnaces were considerable. For central heating purposes, however, a direct comparison could be taken, dependent on the relative efficiencies and calorific value of the fuels used, which he usually took as: Oil, 19,000 B.Th.U. per lb. and boiler efficiencies, 63%; price of oil, 65s. per ton. Coke, 9000 B.Th.U. per lb. (net); efficiency, 50%. Gas, boiler efficiencies, 80%. The C.V. and price of gas and coke would, of course, vary according to the locality.

For general industrial work town gas would require to be sold at approximately 1s. 9d. to 2s. per 1000 c.ft. (500 B.Th.U.) to compare with oil at 65s. per ton. Solid fuel could claim very few, if any, advantages over town gas; and where direct flame contact was required, oil, owing to its very high flame temperature, did not recommend itself.

As regards regeneration or recuperation in furnaces, it did not pay if the temperature was much below 900° C.

He had had some experience of using gas for brass melting, for which there was undoubtedly a large field. Furnace makers had put forward very low consumptions for this work, but from his own experience on pit type furnaces an average figure of 6·5 c.ft. per lb. was the lowest obtained. He understood that a recently designed furnace was giving very much lower results, the figure having been reduced to about 5·0 c.ft. per lb.

The President said that with the existing restrictions on methods of charging for gas, it was possible and necessary to give consumers concessions in other directions. If the price of gas could not be reduced, they could offer free maintenance and reduced installation costs.

Mr. Hole proposed, and Mr. Clark (Weston-super-Mare) seconded, a vote of thanks to Mr. Davies.

Mr. Paterson said he wished to place on record their appreciation of the hospitality of the Directors of the Bristol Gas Company in providing tea for the members.

Commercial Gas Company's Interesting Works

London and Southern Junior Association Visit Wapping

Members of the London and Southern District Junior Gas Association took part in a visit of considerable interest on the afternoon of Saturday, Jan. 7, when they inspected the Wapping Gas-Works of the Commercial Gas Company; for these works are of a very unusual nature and have several features of a unique character.

The Wapping Works.

The Wapping Gas-Works are situated in a very crowded district close to the London Docks, access by road being only obtainable by passing over a bridge. Due to their compactness, Wapping Works can claim to have one of the largest outputs of gas in relation to their size of any works in the country using horizontal retorts.

It is over a hundred years ago since gas was first made at Wapping, but it was not until the year 1875 that the works became the property of the Commercial Gas Company when it amalgamated with the Ratcliff Gas Light and Coke Company.

The total area of the site, about 2¾ acres, although so small, has been brought to its present size by over forty separate purchases, spread over the last hundred years, of small plots of land and buildings. When additional property was purchased, the existing buildings or portions of them, were often left standing and utilized to house the new plant. The coal gas engine room, which was originally a rice mill and strongly built, has a timber trussed roof. The front walls of a row of houses, in which the window and door openings (now bricked up) can still be seen, form a part of the boundary wall fronting a courtway. The works consist of four separate portions, divided from each other by public thoroughfares, but joined together by footbridges over the streets. The congested nature of the works is well illustrated by the fact that both sets of boilers have engine rooms built immediately above them. The frontage along the River Thames measures about 175 ft.

The maximum daily make of coal gas is about 3½ million c.ft. and of carburetted water gas about 1¼ million c.ft. The latter plant has not been used since 1927.

Coal is unloaded from the Company's own ships, the "Stepney" and the "Mile End," each of about 1000 tons capacity, the unloading of each vessel being carried out in 8 to 10 hours. Coal is also brought from the North by Messrs. Cory's ships and transferred to barges which carry it to the Wapping Works. The coal is discharged from barge or steamer to the overhead hoppers, by means of two 2½-ton hydraulic cranes. From the overhead hoppers the coal passes through coal breakers to the belt conveyor and is conveyed to the retort houses and large storage hopper; for besides its own requirements, Wapping supplies the Stepney Works by means of a fleet of steam lorries. The conveyor, which is in two sections, consists of a 30-in. rubber covered belt, the first section of which is 225 ft. long and takes the coal from the jetty to a 30-cwt. automatic weighing machine, through which the coal passes to the second section which is 254 ft. long and carries the coal to the retort houses and storage hoppers. The conveyors and breakers are driven by a 55-kw. generator direct coupled to a 90-h.p. gas engine, with a duplicate set as a stand-by. The maximum amount of coal which can be stored is about 6000 tons.

Retort Houses.

The two retort houses contain 23 settings. No. 1 house consists of 9 settings of 7 retorts, 22 in. by 18 in., and oval in section, carbonizing 70 to 80 tons per 24 hours. The charging machine is an electrically driven D.B. combined pusher and charger. The coke is pushed out into skips, quenched and transported by telpher to the storage hopper.

No. 2 house consists of 14 settings of 10 retorts, 22 in. by 15 in. "D" section, carbonizing 100 to 110 tons per 24 hours. The charging is carried out by means of an Arrol Foulis charger on each side of the settings, and the discharging by means of a Williams-McPhee pusher machine on each side of the settings. The coke falls into skips and after quenching is conveyed by a subway transporter to an intermediate hopper and from there by the telpher to the storage hoppers. Owing to lack of space,

STANTON
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STANTON SPUN 6 YARDS LONG
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STANTON SPUN 4 YARDS LONG
STANTON SPUN 3 YARDS LONG
The Stanton Ironworks Company Limited Nr. Nottingham

only a very small stock of coke, other than in hoppers, can be accommodated.

The high-level telpher, which stands 60 ft. to the top of the boom, has a 16-H.P. hoisting and a 6-H.P. travelling motor. The travelling speed is 600 to 700 ft. per minute with a skip carrying 25 cwt. of coke. The low-level telpher, in No. 1 retort house, has an 11-H.P. hoisting and a 6-H.P. travelling motor. The capacity of the skip is one retort of coke.

Purifiers.

On the coal gas side there are five purifier boxes fitted with luteless lids, 40 ft. by 28 ft. by 8 ft. deep, each taking about 160 tons of oxide in four tiers. On the water gas side there are four boxes fitted with water lutes, 24 ft. by 24 ft. by 6 ft. deep, each taking about 70 tons of oxide in two tiers. Naphthalene extraction plant, situated in the north-east extremity of the works, was erected in 1917, and is approached by a door leading out of the coal gas purifier house.

Not the least interesting and unusual feature of the Wapping Works is the fact that there is practically no storage capacity, the only gasholder being a small relief holder. The result of this is that all the gas made at the works has to pass directly out on to the district. On the occasions when the Wapping district cannot take all the gas being made at the works, a message is sent through to the Company's chief works at Stepney, and the latter shut down their supply to their district, and for the time being put their gas into storage, thus enabling the Wapping Works to dispose of their gas by feeding the whole of the Company's area.

At the conclusion of the inspection, the Association were entertained at tea in the Works Club Room, where they were welcomed by Mr. A. E. Williams, Chief Engineer of the Commercial Gas Company.

The President (Mr. A. Tennant, of the East Surrey Gas Company) proposed a hearty vote of thanks to the Board of Directors of the Commercial Company, with whom he would couple the name of Mr. Williams, for their hospitality that afternoon. It was a long time since their Association had visited a station of the Commercial Gas Company, and to him it had been a unique experience. Of all the gas-works which their Association had visited, they had never been to one of so unusual a character as this, and he thought that the way it was run reflected great credit upon those responsible. He had been reading in a recent issue of the "Gas Journal" [Jan. 4, 1933] of the uses to which gas was put in making the coins of the realm at the Royal Mint. This was in the area of supply of the Commercial Company, and the gas consumed in the various processes amounted to some 72 million c.ft. per annum.

Mr. H. C. Sims (South Metropolitan), the Senior Vice-President, seconded the vote of thanks, and heartily endorsed all that Mr. Tennant had said. It was wonderful how much plant and buildings had been crowded into so small a space. He had been particularly interested in the water spray which was being used for cooling the producer bars. He would also like, he said, to include the names of the guides in the vote of thanks.

Cheap Manufacture.

Mr. A. E. Williams, in reply, thanked the Association on behalf of his Directors for the vote, which he would have great pleasure in conveying to them; and on their behalf he would like to extend to the Association a hearty welcome to the Wapping Works. When a visit to these works had first been suggested, he had felt it his duty to explain to their Secretary that they were not show works; but he hoped that in spite of this they had not found their visit uninteresting or unprofitable. He would particularly draw their attention to the fact that at this station where practically all the plant was of considerable age it was still possible to manufacture gas at a cost below that at most of the London works. There were many points about the Wapping Works which made them different from most other works. First of all, there was the small site; they used to boast that they were making more gas per square foot than anywhere else; but the introduction of vertical retorts had rather altered the position, and they could now no longer make that claim. The $2\frac{3}{4}$ acres covered by the works had only been acquired by a number of purchases over a long period of years, which had materially affected the lay-out of the apparatus. It used to puzzle him why there were numbers of narrow alleyways about the works, and it had been only recently that he discovered that these were old streets. Some of the very earliest concrete purifiers, he continued, were built here—built before the time of reinforced concrete in mass concrete—and when settlement occurred they cracked.

Among other somewhat unusual features was the fact that the surrounding docks made the site an island one, with the result that every gas main from the works had to pass under water. Also there was comparatively no storage, and all the gas had to be sent out as it was made, so that they had to be careful to keep a straight line. This feature was rather more unusual than desirable, and he looked forward to the time when Wapping would send all its gas to the Stepney Works.

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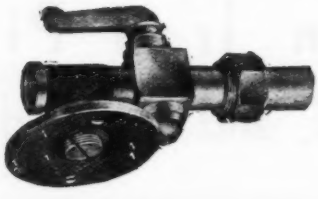
Two-way  *Gas Fire Tap.*

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BOOK REVIEWS

MECHANICAL WORLD YEAR BOOK, 1933.*

The 1933 Edition of this useful publication is well up to the standard attained by its predecessors and includes in addition several entirely new sections. The contents embraces post office regulations, price equivalents, metric and British conversion tables, alphabetical list of advertisers, and classified buyers' directory, while 220 pages are devoted to valuable technical matter which is clearly and concisely set out and well indexed.

The past year has been notable for the remarkable development and achievements of the internal combustion engine, and in view of these developments a new section on Internal Combustion Engines has been prepared for the Mechanical World Year Book. Every aspect is touched upon, including the important one of fuel; important particularly in this country, where we are entirely lacking in natural supplies of petroleum. In this connection an important development of the future is foreshadowed in the production of fuels of various kinds from coal.

The sections on steam turbines and boilers are thoroughly up to date and have been supplemented in the new edition by information on piping for the high temperatures and pressures now used in the most advanced plants, and data on the properties of steam within the same ranges. The transmission of power is likewise developing to meet the needs of the latest prime movers, and to keep abreast of this development the section on this subject in the Year Book has been completely revised and brought up to date.

Mechanization is proceeding apace in many industries, and consists largely of the installation of machinery for handling material. Year by year the sections in the Year Book dealing with this subject are being enlarged to meet the growing needs of engineers in this line. The latest addition is a comprehensive section on Bucket Elevators.

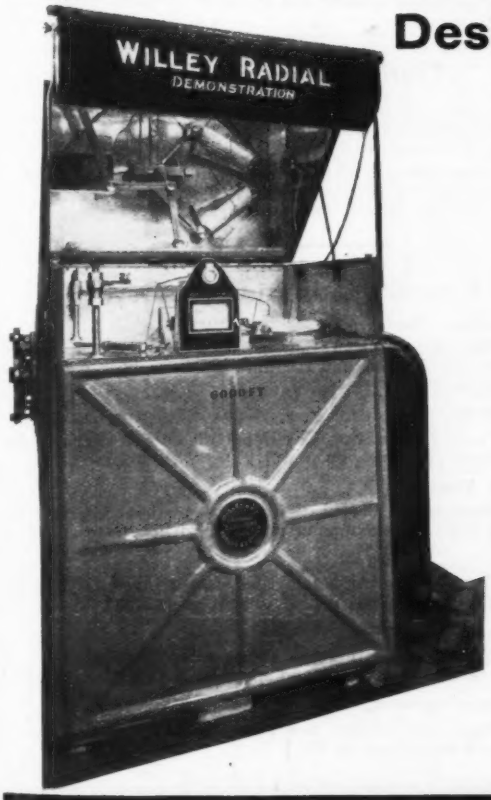
As in previous years, the book contains a vast fund of information and data invaluable to the mechanical engineer in works or factory. Well over a million copies of this publication have now been sold, a figure which shows it to be a most widely-used work of reference among engineers.

* Mechanical World Year Book, 1933. Published by Messrs. Emmott & Co., Ltd., 31, King Street West, Manchester. Price, 1s. 6d. net.

A HANDBOOK FOR INVESTORS.

Invaluable to the investor is Mathiesons' Handbook presenting a concise record of Stock Exchange prices and dividends for ten years of selected securities. The volume for 1933, which is the thirty-fourth year of issue, has been published by Messrs. Fredc. C. Mathieson & Sons, 16, Copthall Avenue, London, E.C. 2, at the price of 5s. net. It is of a handy size, and at the present time, when great interest is being taken in Stock Exchange affairs, there should be a keen demand for a book of this character. Though highest and lowest prices are not necessarily a sufficient guide to the investor, inasmuch as fluctuations may be due to fundamental changes in the value of a security, they do offer help which purchasers of stocks and shares can hardly afford to be without. The type is clear, and the arrangement good; and we are pleased to note that over a dozen gas companies figure among the selected securities.

Equable Measurement of Gas Sales is the Desire of Every Gas Engineer and upon reflection Willey Meters are built with that end in view.



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GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The Stock Exchange re-opened after the holidays with a cheerful tone, and business during the week was fairly brisk. Among the features were the recovery in Home Railway stocks, the satisfactory preliminary statements of three of the "Big Five" banks, and towards the close a sharp improvement in British Government securities. The three-week Account, which has been one of the heaviest for a long time, closed on Saturday, and the immediate future is looked upon with confidence.

Business in Gas stocks and shares was buoyant, and as is usually the case in this market, especially at this time of the year, buyers were in excess of sellers, with the consequence that prices continued to harden. Ordinary stocks were again prominent and several improved in value; the outstanding features being a rise of 4 points in Northampton 5 p.ct. maximum to 102½, and (at the local Exchange) a gain of 2 points in Bristol 5 p.ct. maximum to 111. The latter stock has always held a very high reputation both locally and in London, where the quotation improved 3 points last week to 108½, and on the latter price the yield works out at £4 12s. 2d.%, an attractive proposition in these days for a security of this nature. The Liverpool 5% is another Provincial stock which has been in demand on the London Exchange, and, though not officially quoted on this Exchange, transactions were reported last week in the Unofficial List at 121 and 121½, which are higher prices than those recorded on the Liverpool Exchange at any time during the year 1932.

It is evident that many investors who have been hard hit by the reduction in their incomes from Government stocks are continuing the search for some higher yielding securities and turning their attention to the stocks of public utility undertakings. In this connection there are many high-class ordinary issues in the list of Gas stocks which at the current price, on the basis of last year's dividends, give a yield of between 4¾% to 5%. Moreover, the present prices in most cases include nearly five months' dividend.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Jan.* 9.

There are no changes to report in the prices of tar products, which remain as follows:

Pitch is firm at 100s. per ton f.o.b.

Creosote is 3½d. to 5d. per gallon f.o.b., according to specification.

Refined tar is about 4½d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 5d.; pure benzole, about 1s. 11d. to 2s.; solvent naphtha, 95/160, about 1s. 8d.; and 90/140 pyridine bases, 3s. 9d. to 4s. per gallon naked at makers' works.

Tar Products in the Provinces.

Jan. 9.

The average prices of gas-works products during the week were: Gas-works tar, 33s. to 38s. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked. North, 1s. 7½d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 5½d. to 5¾d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 4½d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 2⅔d.; low gravity, 1¼d.; Scotland, 2¼d. to 2¾d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 2s. to 2s. 1d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene. "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o b. In order to arrive at the f.a s value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Jan.* 7.

Market remains rather quiet after the holidays, but prices show little or no alteration.

Crude gas-works tar.—The actual value is 45s. to 50s. per ton *ex* works.

Pitch.—Supplies are scarce, and export price is round 92s. 6d. to 95s. per ton f.o.b. Glasgow. In the home market value is steady at 95s. to 100s. per ton *ex* works, according to quality.

Refined tar to Ministry of Transport specification is now being inquired for in substantial quantities, and quotations for forward delivery average 4d. per gallon *ex* works naked.

Creosote oil.—Competition is keen and prices are irregular. B.E.S.A. Specification is 2¾d. to 3¼d. per gallon: low gravity, 2½d. to 3d. per gallon; and neutral oil, 2¾d. to 3¼d. per gallon—all *ex* works in bulk.

Cresylic acid.—The market is unchanged with values weak. Pale, 97/99%, is 11d. to 1s. per gallon; dark, 97/99%, 10d. to 11d. per gallon; and pale, 99/100%, 1s. 2d. to 1s. 3d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha.—This product remains steady at 4½d. to 5d. per gallon f.o.r., according to quantity and quality.

Solvent naphtha.—90/160 grade is 1s. 2d. to 1s. 3d. per gallon, and 90/190 grade 11d. to 1s. per gallon.

Motor benzole is not too plentiful at 1s. 4d. to 1s. 5d. per gallon *ex* works.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	o 10½	to	o 11	per gallon at works
Motor ,, ...	1 6½	,,	1 7	,, ,, ,,
Pure ,, ...	1 10	,,	1 11	,, ,, ,,

Trade Notes.

Pressure Reducing Valves.

From Messrs. James Gordon & Co., Ltd., of Windsor House, Kingsway, W.C. 2, we have received a copy of their leaflet dealing with their pressure reducing valves for steam, air, water, gas, &c. These valves are of an exceedingly simple construction and are reliable and sensitive in operation.

Diaries, Calendars, &c.

Further seasonable gifts in the form of diaries, calendars, &c., have been received from the following friends, whose good wishes we heartily reciprocate:

BRITISH JEFFREY-DIAMOND, LTD., Stennard Works, Wakefield.
CLAY CROSS COMPANY, LTD., Clay Cross, near Chesterfield.
HARRIS & PEARSON, LTD., Stourbridge.

Contracts Advertised To-Day.

Benzole Recovery Plant.

The Warrington Corporation invite tenders for the supply of plant for the recovery and treatment of benzolized wash oils. [Advert. on p. 107.]

Boosting Plant.

The Yeovil Corporation Gas Department invite tenders for boosting plant. [Advert. on p. 107.]

Carbonizing Plant.

The Warrington Corporation invite tenders for the rebuilding of vertical carbonizing plant. [Advert. on p. 107.]

Gasholder.

The Yeovil Corporation Gas Department invite tenders for a spiral-guided gasholder, &c. [Advert. on p. 107.]

Pipes.

The Yeovil Corporation Gas Department invite tenders for the supply of cast-iron mains and specials. [Advert. on p. 107.]

Pipe Laying, Excavating, &c.

The Yeovil Corporation Gas Department invite tenders for the above. [Advert. on p. 107.]

Retorts.

The Sidmouth Gas Department invite tenders for the resetting of retorts. [Advert. on p. 107.]

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf-Yr.	Dividends. Last Hf-Yr.	NAME.	Quotations. Jan. 7. (Provincial Exchanges Jan. 6.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,863	Stk.	Oct. 3	7½	7½	Alliance & Dublin Ord. ...	105—115	...	113
374,000	..	July 4	4	4	Do. 4 p.c. Deb. ...	80—90	...	...
557,655	..	Aug. 22	7	7	Barnet Ord. 7 p.c.	132—142	...	...
300,000	1	Oct. 17	1/9½	1/4½	Bombay, Ltd.	23/—25/-	+1/-	24/—24/4½
177,750	Stk.	Aug. 22	9	9½	Bournemouth sliding scale	195—205	...	154—154½
550,050	..	..	7	7	Do. 7 p.c. max. ...	145—155	...	...
439,160	..	..	6	6	Do. 6 p.c. Pref. ...	135—140	...	...
50,000	..	Dec. 19	3	3	Do. 5 p.c. Deb. ...	75—80*	...	...
162,025	..	..	4	4	Do. 4 p.c. Deb. ...	98—103*	...	...
210,000	..	..	5	5	Do. 5 p.c. Deb. ...	117—122*	...	...
357,900	..	Aug. 22	7½	7½	Brighton, &c. 6 p.c. Con. ...	143—148	...	...
540,000	..	..	6½	6½	Do. 5 p.c. Con. ...	127—132	...	137
195,500	..	..	6	6	Do. 6 p.c. B Pref.	135—145	...	...
1,287,500	..	Aug. 8	5	5	Bristol 5 p.c. max.	110½—111½b	+2	...
120,420	..	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	96—98a*	...	...
217,870	..	..	4	4	Do. 2nd 4 p.c. Deb. ...	95—97a*	...	...
328,790	..	..	5	5	Do. 5 p.c. Deb.	115—120a*	...	...
855,000	..	Oct. 3	8	7	British Ord.	142—147	...	147
100,000	..	Dec. 19	7	7	Do. 7 p.c. Pref.	140—150*	...	...
350,000	..	..	—	5½	Do. 5½ p.c. Pref. ...	105—110*	...	...
120,000	..	..	4	4	Do. 4 p.c. Red. Deb. ...	90—95*	...	...
450,000	..	..	5	5	Do. 5 p.c. Red. Deb. ...	105—115*	...	...
160,000	..	July 4	5	5	Cambridge 5 p.c. Deb. ...	117—122	..	...
100,000	10	Dec. 5	6	6	Cape Town, Ltd.	7½—8½	...	...
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	88—93*	...	...
626,860	..	Aug. 8	6	6	Cardiff Con. Ord.	110—115	...	...
217,860	..	July 4	5½	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	..	Aug. 8	6½	5	Chester 5 p.c. Ord.	93—98b	...	...
98,936	1	Oct. 17	2/-	2/-	Colombo, Ltd. Ord.... ...	25/—30/-	...	...
609,204	1	Oct. 17	1/10'90	1/11'47	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	..	1/3'54	1/3'30	Do. 8 p.c. Pref.	19/6—21/6	...	21/—21/4½
1,822,505	Stk.	Aug. 8	5½	5	Commercial Ord.	110—115	...	...
475,000	..	Dec. 19	3	3	Do. 3 p.c. Deb. ...	73—78*	...	76—78
240,744	..	—	—	—	Do. 5 p.c. Deb. ...	117—122	...	122
807,560	..	Aug. 8	7	7	Croydon sliding scale ...	139—144	...	...
469,590	..	..	5	5	Do. max. div.	95—100	...	...
500,000	..	July 4	5	5	Do. 5 p.c. Deb.	120—125	...	...
542,270	..	Aug. 8	10	7	Derby Con.	150—160e	...	...
55,000	..	July 4	4	4	Do. 4 p.c. Deb.	76—85e	...	99
209,000	..	Sept. 5	5	5	East Hull Ord. 5 p.c. ...	97—102	...	...
179,500	..	Aug. 22	5½	6	East Surrey Ord. 5 p.c. ...	110—120	...	...
155,019	..	Dec. 19	5	5	Do. 5 p.c. Deb. ...	116—121*	...	117
1,002,180	..	Sept. 19	16½	15	European, Ltd.	125—130	+3	126—129
19,405,992	..	Aug. 8	5½	5½	Gas Light & Coke 4 p.c. Ord.	24/6—25/6f	...	24/10½—25/4½
2,600,000	..	..	3½	3½	Do. 3½ p.c. max.	80—85	...	82½—84
4,477,106	..	..	4	4	Do. 4 p.c. Con. Pref. ...	98—101	...	99½—101
6,102,497	..	Dec. 19	3	3	Do. 3 p.c. Con. Deb. ...	77—81*	...	77½—78½
3,642,770	..	..	5	5	Do. 5 p.c. Red. Deb. ...	113—116*	...	115
3,500,000	..	..	4½	4½	Do. 4½ p.c. Red. Deb. ...	108—112*	+1	110—111½
264,011	..	Aug. 22	—	6	Harrogate New Cons. ...	110—115	...	...
82,500	..	Aug. 22	7	7	Hastings & St. L. 5 p.c. Conv.	102—107	...	...
258,740	..	..	5½	5½	Do. 5½ p.c. Conv.	102—107	...	...
70,000	10	Oct. 17	†10	†10	Hongkong & China, Ltd. ...	9½—10½	...	...
213,200	Stk	Aug. 22	6	6	Hornsey Con. 3½ p.c. ...	117—122	...	...
5,600,000	..	Nov. 21	14	10	Imperial Continental Cap.	200—210	+2	204—209
223,130	..	Aug. 8	3½	3½	Do. 3½ p.c. Red. Deb.	90—95	...	...
235,242	..	Aug. 8	8½	8½	Lea Bridge 5 p.c. Ord. ...	162—162	...	...
2,145,907	..	Aug. 22	6	6	Liverpool 5 p.c. Ord. ...	119½—120½b	...	...
245,500	..	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	100—110b*	...	...
306,088	..	July 15	4	4	Do. 4 p.c. Deb. ...	100—102b	...	...
165,736	..	Sept. 5	10	8	Maidstone 5 p.c. Cap. ...	160—170	...	...
56,176	..	Dec. 19	3	3	Do. 3 p.c. Deb. ...	68—73*	...	...
75,000	b	Dec. 5	†10	†10	Malta & Mediterranean ... Metropolitan (of Melbourne)	7½—8½	...	...
392,000	..	Oct. 1	5½	5½	5½ p.c. Red. Deb.	98—103	...	...
171,978	Stk	Sept. 5	5	5	M. S. Utility "C." Cons. ..	100—105	−2½	103 - 105
718,657	..	..	4	4	Do. 4 p.c. Cons. Pref.	90—95	...	91
112,126	..	July 4	4	4	Do. 4 p.c. Deb. ...	95—100	...	96—98
148,955	..	..	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
675,000	..	21 May '31	16	16	Montevideo, Ltd.	35—45	...	...
2,061,315	..	Aug. 8	5½	5	Newcastle & Gateshead Con.	23/—24/-d	...	...
682,856	..	..	4	4	Do. 4 p.c. Pref. ...	94—95d	...	...
691,705	..	June 20	3½	3½	Do. 3½ p.c. Deb. ...	89—91d	...	...
277,285	..	Nov. 7	5	5	Do. 5 p.c. Deb. '43...	103—107d	...	...
274,000	..	Aug. 8	5	5	Newport (Mon.) 5 p.c. max.	93—95a	...	...
199,940	..	Aug. 22	7½	7½	North Middlesex 6 p.c. Con.	135—145	..	...
396,160	..	Aug. 8	5	5	Northampton 5 p.c. max. ...	100—105	+4	...
300,000	..	Dec. 5	7	9	Oriental, Ltd.	110—115	+1	...
205,162	..	Dec. 19	8	8	Plym'th & Stonehouse 5 p.c.	140—150*	...	...
504,416	..	Aug. 22	8	8	Portsm'th Con. Stk. 4 p.c. Std.	150—160	...	...
241,446	..	..	5	5	Do. 5 p.c. max. ...	97—102	...	...
114,000	..	Aug. 8	5	6	Preston 5 p.c. Pref.	105—110	...	...
686,312	..	July 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	77—82	...	...
389,813	..	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	75—80*	...	...
150,000	10	Sept. 19	6	6	San Paulo 6 p.c. Pref. ...	6½—7½	...	...
1,736,968	Stk.	Sept. 5	6	6	Sheffield Cons.	113—116e	+1	...
95,000	..	July 18	4	4	Do. 4 p.c. Deb.	92—96e	...	...
133,201	..	Sept. 5	5	8½	Shrewsbury 5 p.c. Ord. ...	118—123	...	...
90,000	10	June 6	15	15	South African	4—6	...	...
6,709,895	Stk.	Aug. 8	7	5	South Met. Ord.	125—128	+2	123—126½
1,135,812	..	..	6	6	Do. 6 p.c. Irred. Pf.	138—143	...	138—140
1,895,445	..	July 4	3	3	Do. 3 p.c. Deb. ...	78—82	...	79—78½
1,000,000	..	July 18	4	5	Do. 5 p.c. Red. Deb.	110—115	...	...
91,500	..	Aug. 8	8½	8½	South Shields Con.	140—145d	...	...
1,543,795	..	Aug. 8	6	6	South Suburban Ord. 5 p.c.	121—126	+3	121—123
300,000	..	..	5	5	Do. 5 p.c. Pref.	110—115	−3	113
668,837	..	Dec. 19	5	5	Do. 5 p.c. Deb.	117—122*	...	...
647,740	..	Aug. 22	5	5	Southampt'n Ord. 5 p.c. max.	102—107	...	108
121,275	..	Dec. 19	4	4	Do. 4 p.c. Deb.	95—100*	...	...
350,000	..	Aug. 8	—	9/-	Swansea 5½ p.c. Red. Pref.	110—114	...	...
200,000	..	Dec. 19	6½	6½	Do. 6½ p.c. Red. Deb.	103—108*	...	104½
1,076,490	..	Aug. 8	6½	6½	Tottenham and District Ord.	131—136	...	133—135
300,000	..	..	5½	5½	Do. 5½ p.c. Pref. ...	120—125	...	...
193,005	..	Dec. 19	4	4	Do. 4 p.c. Deb. ...	95—100*	...	96½
85,701	..	Sept. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	67—72	...	...
346,069	..	Aug. 22	7	7	Uxbridge, &c., 5 p.ct. ...	130—140	...	...
88,330	..	..	5	5	Do. 5 p.c. Pref. ...	110—115	−2	...
1,322,220	..	July 4	7	7	Wandsworth Consolidated	138—143	...	...
1,090,373	..	..	5	5	Do. 5 p.c. Pref.	113—118	...	115—116
1,317,964	..	Dec. 19	5	5	Do. 5 p.c. Deb.	117—122*	...	119½—121½
158,400	..	Aug. 22	6g	5	Winchester W. & G. 5p.c. Con.	107—112	...	...

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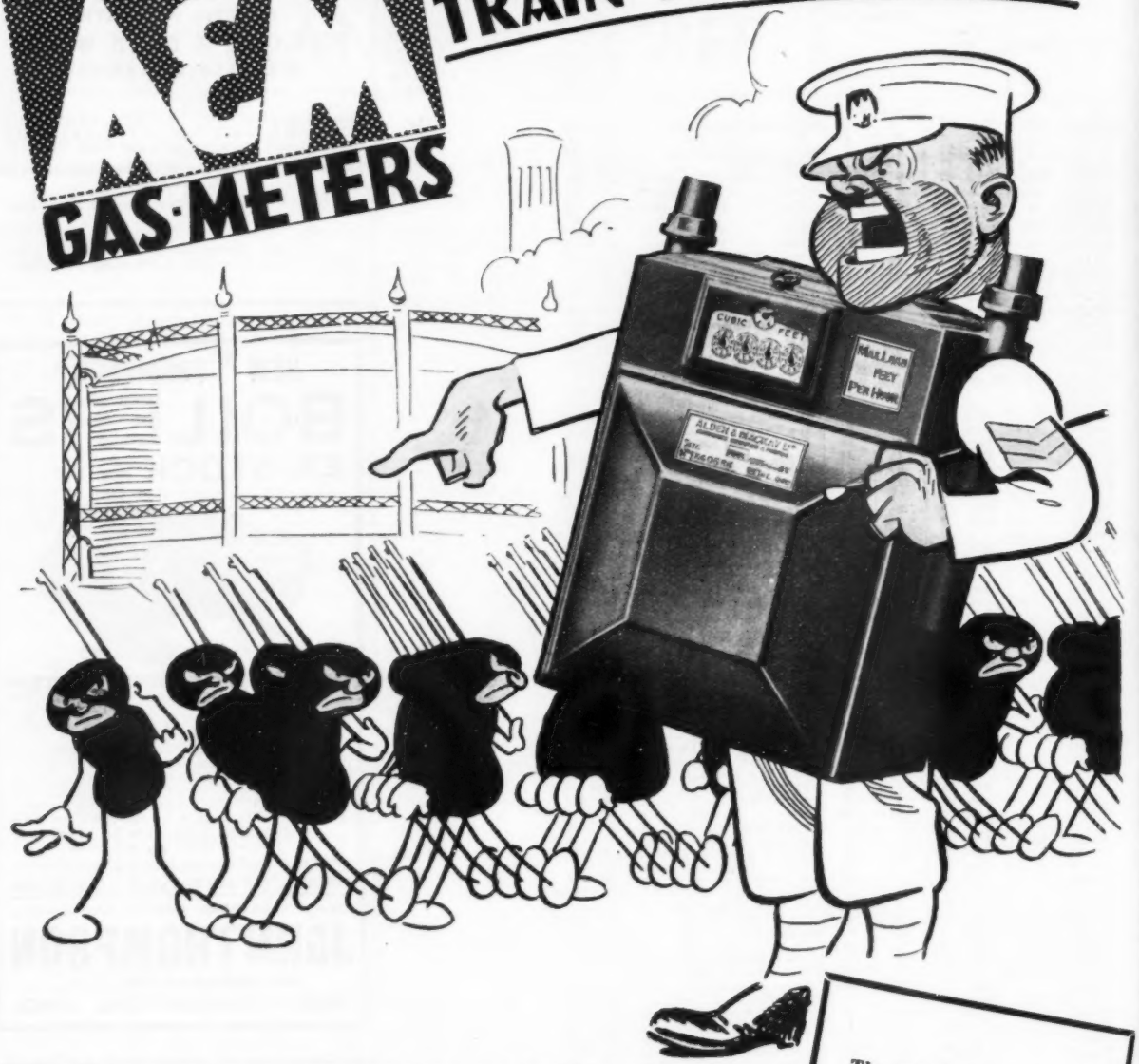

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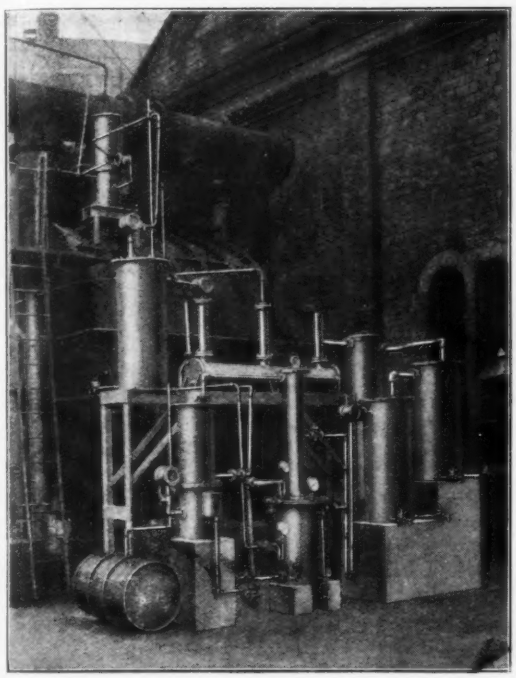

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